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Devoted Primarily to all Scientific Studies of Nature in Elementary Schools

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The Science-Spirit in a Democracy

BY L. H. BAILEY

President's Address before American Nature-Study Society, Columbus, O., December 30, 1915

We have had many definitions of nature-study. I am sure that all of them are interesting. We have been careful to draw the distinctions, for our technical and professional purposes, between nature-study on the one side and science-teaching on the other; but we all come together in the inquiry of nature in one way or another, and we are all, to that extent, making quests in science. The methods of presenting our work to pupils, and the organization of it in courses of study, naturally require much of our attention; but for the moment I ask you to consider some of the large relations of the spirit of scientific inquiry as it applies in a spontaneous and democratic form of society.

The Science-Spirit

To find the fact and to know the truth,—this is the purpose of the quest of science. If the truth can be applied to the arts of life, the gain is good; but the truth is valuable on its own account, and for the range and reach that it imparts to the mind. As the truth is of itself, as it knows no person and no condition, so is its application impartial and so is its effect on the mind uncompromising.

One never makes the quest with success unless the mind is open at the start. The quest is to find out, always to discover, never to prove a thesis or to demonstrate an *a priori* position. Herein does this mind differ from that of the advocate who must

merely prove a case, or from that of the preacher who must support a dogma, or from that of the politician who must defend a party.

Science cannot be dogmatic if it is science; it cannot be partisan if its judgment is that of the open mind, seeking. Our policies are largely controlled by the partisan, and by the publicist who endeavors to support his argument. Science is not argumentative: the whole statement of its case is merely the statement of the fact and its significance. There is no taking of sides to truth. The prejudiced mind—the mind that prejudges—is never the scientific mind. Therefore, does the science-spirit introduce a modern element into society; and in the end it will reshape our political philosophy.

A few weeks ago a great meeting was held to discuss a difficult public situation, involving disease. There were violent opinions and strong parties for and against. One man read a paper giving the facts, without argument. The facts, not the arguments or the heated debates, determine the procedure. No species of argument can influence a micro-organism.

So accustomed are we to partisan opinions and to subjective "beliefs" that the plain statement of facts may fail to hold our attention. They do not have sufficient color, or power of entertainment to elicit applause, and we say that the reciter of them is impractical, which is the heaviest epithet that we can hurl at a man in a commercial epoch.

Never have we arrived at mastery and never do we discover the greatest intellectual delights until plain facts, ungarnished, standing for themselves, are poetry and painting and inspiration. Nothing is so beautiful or abides so long as the truths of facts; and keen is the joy when we partake in the discovery of them. To read with relish a clear statement of the plants that grow in a field, of the birds that breed in a wood, of the rocks that lie on a hillside, is a rare and choice satisfaction and one that we love to share with every friend.

In the truth there is no secrecy, no deals, no combinations, no conspiracy, no favor, no courtesy to high opinion. Whether there will be an eclipse does not depend on discussion nor even on agreements of any number of persons. Whether a species migrates in twos or in tens does not depend on what somebody "believes." Whether the summer is wet or the winter is cold does not depend on the will of the king or the kaiser.

And if in the truth there is no secrecy, so the science-method is not a secret method. It is not a subject for underhand dealing. Its very essence is of openness, straightforwardness, integrity. It always makes for understanding. If there were no intrigues of diplomacy there would be no international wars.

Every discovery of new truth, however near or remote, is an example in intellectual poise. It is a contribution to self-mastery, a reason for independence. The greater the number of discoveries, the wider their range, the more widespread their publication, the greater will be the independent thinking of the people; and finally the intellectual attitude will express itself in political practice.

It is our privilege, as it should be our joy, to open the minds of the blessed young to these great satisfactions and these sweet influences. We begin with them before the regular scientist has them: let us prepare them well for him. So early may some of us have them that we may breed a habit of thought that will last through life: what a blessing is a stabilizing habit of thought that lasts through life!

The science-spirit removes at once the fear of truth and the fear of dogma and the fear of nature. Ignorance is always bondage, and it is the truth that shall make you free.

Its Significance to a Free People

For an investigator we want a man or a woman who is free-minded and who searches without making promises. For a public officer we want a person who thinks as we do: this is what political parties mean. If we were scientific, we would want an officer merely because he were best qualified. Our method of government rests on this partisanship,—on my side and your side, the pros and cons, the ins and outs, the saints and sinners, the democrats and republicans. It is said that in the nature of things and in the quality of the human mind, the life of the race must be partisan. We are told that there is good and evil, a proposition, however, not capable of proof; that there is day and night, but the day and the night both are continuous and they merely pass over us where we stand; that there is up and down, but not one of us knows at this moment whether he is on his head or on his feet. The processes of nature are all continuous and we interpret the contrasts as if they were essential differences in substance.

There are no parties in science. There may be difference of opinion when we do not yet know the truth, and variations in interpretation, and personal antagonisms between those whose science does not reach to the heart; but government at present is organized partisanship. A merchant is not partisan in his shop, nor a manufacturer in his factory, nor a farmer on his farm, nor a teacher in his class-room; but at the polls these persons think they are not citizens unless they have opinions which are correct because they hold them. This long-continued practice solidifies opinion and makes it impregnable to evidence; we come at length to substitute habit for reason.

It is not to be desired that there shall be an end to argument and discussion, but we ought to know that we cannot solve our questions by unscientific polemics, however much we may settle them for the time being.

I was reading a book on the war, and expressed my interest in it. My friend asked which side the author took. I replied that he took neither side. With astonishment he asked me how, then, the man could write a book on the war. To come to a public question merely with the desire to know and not to have an opinion in advance, is sufficiently unusual to excite comment. Verily, we are yet a long way from the open mind, the one that does not immediately take sides. The scientist makes inquiries long before he has an opinion. We may be open-minded with equanimity and with much self-admiration on abstract questions that are far off, but when they become concrete we are partisan. It is difficult to see facts in the face of self-interest, but this is nevertheless the conquest of the science-spirit.

When do we ever acquire the open mind on the tariff during a political campaign? It is a vast pity that the tariff is ever mentioned in political platforms. It is not a partisan question. It is an economic problem. It should be worked out impartially by persons who are competent to work it out and quite aside from the question of the person who shall be President of the United States. We should attack the problem in the same spirit that we attack a problem of productivity in an experiment station. We should first divest ourselves of inherited opinions and street-corner sagaciousness and then seek to know the truth; then we can make such use of the knowledge as the country seems to require, and this requirement should likewise be made the subject of long-continued impartial investigation.

The most significant contemporaneous movement in politics is the independence of the voter. He is breaking away from parties. It is said this is beacuse he is tired of machine control and boss rule and corruption and all the rest; but these are reasons, not causes. I think the cause is the spread of the science-spirit. Politics may not be assuming a scientific aspect, but the voter is swayed by reason. We say that the voters are becoming more intelligent; but whence comes this intelligence if not from the teaching of the modern truth of science, with which every text-book and every periodical is filled, and by which every teacher is more or less animated, and which every experiment station and every research laboratory is giving as an example in mental attitudes? People begin to see that blindly following a party settles nothing, and that partisanship is now an anachronism.

Is it not time to introduce into politics the attitude of the open mind independent of party programs, to approach public questions in something of the spirit with which we approach the problems of science, desiring to know the facts, to learn, to decide after we know rather than before, to set forth good educational movements? We should not desire to eliminate sentiment from even political campaigns, and we shall always follow great leaders and leaders thereby will have parties; but our sentiment nevertheless may be rational and we may naturally choose the leader who is the least led by others. The making of government is a serious business, and in a democracy we make it every day: the way in which the people at large approach the question will determine the result.

An Illustration or Two

I hesitate to make an illustration. So much are we dominated by party considerations that we may not discuss burning questions of politics in a general gathering; this itself is a sad commentary on our public procedure. It is absurd. We come to an assemblage like this with a feeling of relief from persistent propaganda and acrimonious controversy; and yet my discussion would be pointless if I did not make an application. I desire only to suggest possible non-partisan methods in movements that are current or at least recent.

I will say, first, that the woman suffrage movement affords an example of the attitude under discussion. It introduces a

new and violent partisanship, and at the very time when partisanship is supposed to be losing its force. We have the pros and the antis, one set solidly over against the other. The merits of the case are confused in the rivalries. Much of the literature of these opposed camps is discouraging. The real problem here, for the present voter to decide, is very simple in its statement. It is only this: can we now assimilate this extra vote? It is not a question as to whether persons inferior to women now have the vote; it is not a question of sentiment or of desserts; the vote is not a right to be demanded or a favor to be sought, but a privilege to be granted. Whether we can now assimilate the extra vote cannot be settled by petitions, by the use of "influence," by "literature," by banners, or by parades. If a fair proportion of the women would vote, as good a proportion as of the men, the extra vote would undoubtedly be safe. Under male suffrage it is only when a large vote is cast that we can hope to offset the forces of danger. The problem before the women is clearly to convince the women rather than the men. When the women are convinced, so that the vote will be safe, the movement is won. If the vote should be granted before the women are convinced, the result would not be a real success for the movement. I wish that this suffrage movement might express a new and a better process in politics, in the form of a widespread and quiet campaign of education with the women of the country, and not divide the woman's influence into hostile partisan camps.

Let me bring another illustration. In New York a new constitution was recently defeated at the polls. It was said to be the best state constitution ever proposed. Some persons say it was defeated by machine politicians who were afraid of it; this I doubt. The vote against it was widespread. To my knowledge, non-partisans voted against it. It may not have been framed in partisanship but the movement was born in partisanship, or least so supposed by the people, and was handicapped before it was made. The final draft was completed and published only a short time before election, and it made a very long and technical document that combined details of procedure with statements of principles. Little, apparently, was left to the legislature to work out into practice. There was strong objection to parts of it, and yet the voters were asked to pass upon it nearly *en bloc*, accepting it all or rejecting it all. Moreover, a company of supporters organized

to put it through, and this undoubtedly solidified the opposition. I think there was a strong feeling among the people that a new dispensation had been handed them from above. Although printed and disseminated widely, the document did not have a fair hearing before the people, they did not understand all the implications, they had no opportunity to express a real choice on the different measures in it and some of which were novel and striking. It is too bad that this great document could not have been made the means of public education throughout an entire winter with privilege to vote on it at a special election. The state should have taken means to have had the constitution discussed deliberately before labor-unions, granges, teachers, and many other groups, not so much with the partisan idea of passing it as of understanding it. It could have been made a means of great civic awakening even though the constitution failed of adoption in the end. As it is, only another passing episode of legislation is in the public mind, and it seems to have aroused little desire to reopen the question and to solve certain great political problems on their merits. Perhaps its defeat may even delay the opportunity to keep the political establishment abreast of other human attainments.

And now, again, let me take an illustration from the field of personal publicity. The partisan receives the applause of his party. For a moment he is a chieftain. He is elevated perhaps far beyond his merits, his commonplaces are labeled as wisdom, his virtues are paraded, his portrait adorns the shop windows, the billboards and fences, and it appears proudly in the newspapers. Personal advertising is far too easy in party programs. It makes much of the ostentation of premature reputation. Too often it tries to make reputation by means of publicity. How many are the young men whom I have known to be broken on the wheel of publicity, and crushed in the small show of public office! The only publicity worth the while is that which comes slowly, as the person grows in age and experience and good works. It endures until the end, and is not the flicker of a moth before a spot-light. It may be all independent of newspaper comment or notoriety. The passing of the word of approval or appreciation from mouth to mouth, from organization to organization, is more significant and more worth while than all the publicity of all the periodicals. When the bald publicity program leaves our politics shall we have a new breed of office-holders,—those who do not look for tempor-

ary public acclaim, who are little concerned about some mole-hill of "standing" in a community; and then shall we go to the merits of our public questions. We have these men now, to be sure; but there ought to be none other. The man who desires much publicity is not the safe public servant, and yet our party system discovers such men.

The Application

What is the purpose and what the value of our widespread teaching of science if not that the mental attitude is to be applied in all the horizons of life? If this attitude were applied in public affairs we should forthwith have a new politics. The great gains in scientific research and in science-teaching lie in these mental postures rather than in the direct application to invention, production and communication.

It is the method of science to proceed from the concrete to the abstract. It sets the example of discovering first the fact and then building thereon the philosophy of action; and yet do we not have in public places many persons who are spinning blue-sky schemes of administration that may affect all of us? And have we yet outgrown the older education, which leads us too early into the theoretic and which too often lands us in pleasant and easy sophistries?

Science is free to all men so far as they are able to understand. It is no discriminator of persons. It eliminates no man because of his position or his name or relations, but only as he lacks ability to comprehend. It shuts no doors, but it opens many.

Science also is unselfish. To be selfish with the results of one's scientific labors is as much to be reprehended as to be selfish with time or money or counsel, and even more so. To act grudgingly with one's facts or discoveries, to hoard and withhold, to stand primarily for "credit," is not the science-spirit.

The agricultural experiment stations are factors of tremendous significance to any self-governing people. The farmers, who comprise the bottom factor in any democracy, have been among the most prejudiced of men. With them tradition has challenged fact. Other occupations may come and go, schemes of politics and social revolutions may pass, but the farmer is on the land forever. Slowly but certainly we are placing before him a new way of approach to the problems of life, an inspiring and

authoritative example in the conquest of his conditions. At first perhaps rebellious, then tolerant, then curious, then cautious, he now accepts the new way and begins to demand exact reasons for everything he does. Gently this attitude will work itself out in ethics, in education, in politics, in local leadership, as well as in agriculture and in commerce. Our experiment stations are laying the very foundations of democracy.

I begin to see a new ambition arising in the open country, as I see it also in the towns. It is an ambition to be of service, not merely to hold office; it is a desire to know the facts and then to project a rational line of action. Formerly, to hold some small political office was practically the only outlet in rural districts for a young man of ambition, aside from being a good farmer; and the office was a gift. Now the opportunities are made by the man or woman without other ambition but to be of use.

I know there are those who look on the rural situation hopelessly except only so far as the production of supplies is concerned. A man of high attainment remarked recently that he sees no chance that the farmer will ever apprehend the spiritual side of his situation, for if he has a vision he forthwith quits farming. Ah, well! The present moment is not the measure of time; and yet even the present moment gives more promise than any other moment has ever given, and those who know the people far and wide on the land have no despair. We must face the man and woman right toward their work, providing them the facts, opening the windows of the imagination, cutting them loose from the slavery of old restraints; and as for the rest, we shall wait.

The great nature-folk, the farmer-folk, who own a bit of the earth, who do not run away from winter and storm and blight, must hold us to our planet. Our responsibility is to see that they have knowledge and understanding. They do not restrain us from the earth. There may be closed shops but there are no closed farms. Farming is yet unorganized as an occupation, and long may it so remain; labor is organized on a partisan basis. We are fond to say that farming rests on knowledge of natural science; very good, then: every occupation that rests on science must be substantial and progressive. Permanency and moral worth lie in the nature of the occupation.

And now I have given you my outlook and I must bid you good-day. Your work lies in the foundations of things. However

far we may go, we never go beyond nature. However great we may be, our greatness is founded on truth. However much we desire, the spirit emerges from a fact. Whatever may be our high fortune among our fellows, we come back at last to the earth, to the earth that gave us birth. Every man or woman who works in factory or field, who sails the sea or digs in mines, who finds his efforts with books or machines or with vast enterprises, who prophesies of things to come,—every one is touched by the same wind, encouraged by the same rain, grown by the same sun, uplifted by the same birds, guided by the same stars. Nature is one vast democracy.

I would not have you think that the science-spirit is the last stage in our intellectual evolution; some day the race will gain its highest conquests by free and plain intuition; but first we must see clearly and we must know. First must we be able to use the five senses.

Then teach! The teacher works with the raw stuff of human lives. And you, who teach the nature-studies, you open a solid fact with every lesson and you lead the imagination far away.

The Annual Meeting and Election of Officers

The meeting as announced in the December number was held at Columbus, Ohio, December 30 and 31. The program as printed in that number was carried out with enthusiasm. The attendance was good and was notable especially for the large proportion of heads of departments of nature-study in various normal schools and teachers colleges of both east and west. A couple of the papers were read by the Secretary in the absence of the authors; the School Garden Association representatives failed to appear; but otherwise the program was complete. The papers were more definite and showed greater unanimity of opinion on methods, materials and their organization than usual. Such papers as have not already appeared will appear in forthcoming numbers. At the business meeting an amendment to the constitution was proposed, to be voted on next year, changing the tenure of office of the president of the Society from one to two years.

A communication expressing the appreciation of the note of greeting sent from our Society to the School Nature-Study Union of Great Britain was read from the secretary of that Society.

Mr. F. W. McBride the new director elected by the Indiana Nature Study Society, now affiliated with the main society, was present and spoke of the activities of his home Society. Two other local nature study societies were invited to affiliate with us, one at Toledo, Ohio, a member of which Mr. Van Cleve was present.

The officers are now as follows: President L. H. Bailey was re-elected; the vice-presidents elected are M. A. Bigelow (N. Y.), B. M. Davis (Ohio), C. F. Hodge (Oregon), S. B. McCready (Canada), Alice J. Patterson (Illinois).

In the list of directors those numbered (1) were elected last year and hold over for the current year; (2) are the ones elected at the present meeting who hold office two years; (3) are those elected from the local branches as indicated. (1) L. H. Bailey, (N. Y.), (1) Anna B. Comstock (N. Y.), (1) John A. Dearness, (Ont.), (3) H. C. Drayer (Mo.), (2) J. A. Drushel (Me.), (3) F. W. McBride (Ind.), (1) Jas. G. Needham (N. Y.), (2) C. H. Robison (N. J.), (2) S. C. Schmucker (Pa.), (1) W. A. Slingerland (N. Y.), (3) G. Straubenmueller (N. Y.), (2) Gilbert H. Trafton, (Minn.), (2) R. E. Wager (Ill.), (3) W. W. Whitney (Ill.).

The present Secretary-editor was re-elected.

Indoor Plants

CHESTER A. MATHEWSON
Brooklyn Training School for Teachers

Times change, and even the revered rubber plant (Ficus elastica) of other days in Brooklyn no longer commands the attention it did. As a house plant, it nevertheless has no superior. It thrives under very indifferent care, resisting adverse conditions of moisture, atmosphere, illuminating gas, dust, light, temperature, and parasitic insects to a remarkable degree. Even schoolrooms do not offer severe difficulties in the growth of a rubber plant. It is said that in Brooklyn the growers used to sell a score of these handsome plants where now they sell one.

If the schools can educate the children, and through them the parents in the direction of encouraging the growing of plants in the home a distinct service will be rendered. It is only in and through nature-study with children that the schools can do this

sort of thing. The teacher's problem is chiefly in knowing what plants are best, and how these plants are affected by the various factors of the indoor environment. The method of teaching about these things then becomes a matter of directing the children's attention so that they will make good observations and draw proper conclusions. It is the purpose of this article to give some help to the teacher or parent who has had little to do with indoor plant culture.

If the teacher will adopt the scientific attitude in finding out about indoor plants time and money will be saved and disappointment avoided. The best plan is to choose a few plants at the start. In the fall one or two kinds of bulbs should be chosen for forcing. If from season to season results are carefully noted (preferably in writing) and conclusions drawn, the individual will accumulate a fund of experience. Practical experience will insure the best results in trying to awaken an interest in home plant culture. Mere reading about plants will not give the information in a way that will guarantee successful application of the ideas thus gained. If one has had some experience it then becomes easy to assimilate new ideas and apply them. Some time ago a friend showed me a large Boston fern that was in poor condition and asked me what was the matter with it. The pot was snugly fitted into a brass jardinere, and I inquired whether it was ever removed. No, it had been in ever since being received from the florist; and the suggestion was offered that it be taken out for a few weeks. This was done and with a little trimming the fern began to look all right. Experience will emphasize the necessity of air around the roots. Brass and glazed containers tend to shut off such air supply, especially if they are not much oversize.

It may be well to consider the factors affecting plant growth indoors and the possibilities of modifying these factors. In the colder months of the year when house plants are most useful in beautifying our surroundings the rooms in which we live have an extremely dry atmosphere. Most of the time the humidity is only about a third of what it should be for the health of human beings. But people go out of doors and thus escape the effects of constant exposure to very dry air. Not so with plants, which suffer from this same enfeebling dessication. The remedy usually applied is excessive watering of the roots, no benefit however, being derived from this. The proper remedy would be to put the plants out

of doors on days when the temperature is not too low, and in addition to spray the foliage both above and below as often as possible. In a city apartment this may be done, e.g. in the kitchen tubs, or possibly in the bath tub.

If gas is used in the home for cooking, etc., the fumes of burning or escaping gas have a very bad effect on plants, especially the ferns, whether hardy or not. Plants should be kept in rooms where gas is not used if possible. No other remedy against the fumes can be applied. Whatever helps ventilation from the human point of view will tend to nullify the effects of gas on plants.

Sunlight is absolutely indispensable, and as a rule the more the better. If there are only north windows available plants cannot thrive. They can exist, and survive for a time. If south or west windows are available they should be used. Sometimes the light is partially cut off by a stone coping or a fire escape. This will always have a bad effect on the plant. It is difficult to suggest remedies for poor light conditions. If the householder will note places where direct sunlight strikes at certain hours and place the plants there at that time the weakening effects of poor lighting will be partially overcome. Turning the plants around also helps them. If a sunny window is available no thought need be given to the light factor; it will take care of itself. Even for ferns, direct sunlight is better than too little light.

Most people think that they know how to water a plant, and yet many plants in the home or school are killed by improper watering. It should be borne in mind that the roots need air as well as the parts above ground, but if a plant is kept constantly soaked the effect is the same as if the air supply were shut off. Root hairs, although thin-walled, are not like fish-gills in their physiological functioning and few species can get air from water. (English Ivy, Coleus, and Tradescantia are some of the common exceptions to this). The practical question always is, how much water, and how often needed? If we think of what happens out of doors we have the answer. The soil there is not continually wet and yet plants thrive. On the other hand, if the fine rootlets of a plant get dry the cells die. After that it is only a question as to the length of time the plant can survive. If vegetative reproduction is powerful, as in the geranium, the plant may be extremely resistant and recover if watering is resumed. The remedy for the results of excessive watering is to increase the intervals. Not a

daily soaking as many think, but a bi-weekly soaking, gives the best results. The soil should look as though it is beginning to dry out before the soaking is repeated. Conversely, a little water every day or twice a day is not according to Nature's plan. It rains, the ground gets thoroughly moistened, then begins to dry out. The plan indoors should follow this method.

Sometime an algæ or other growth (bacterial) on the exterior of a pot will shut off the air supply to the roots by clogging the pores of the pot. The remedy for this is scrubbing with soap and water. The pot should be porous, and should be kept so.

The condition of the soil is intimately bound up with the problem of proper watering. When plants are received from the grower the soil is usually quite loose. As time goes on it becomes packed, hence often poorly drained and poorly supplied with air. If such a soil gets very wet it tends to "sour" and plants may show the phenomenon known as "damping off," i.e. molding of the stem at the point where it enters the soil. This is especially liable to happen in a rich soil. The remedy here is to stir up the soil occasionally, just as would be done out of doors. The chief ingredients of a good soil for indoor plants are loam, sand, and either well-rotted manure or leaf mold, in about equal proportions. If there is too much sand the soil fails to hold enough moisture. If too much loam, which is needed to give weight and stability, it tends to become soggy. The remedy for a poor soil is to be applied only after observation with a view to discovering what is lacking. Sometimes an apparently heavy soil merely calls for some drainage (gravel, sand, bits of crushed flower pots) to be placed in the base of the pot or box. Transplanting and repotting should be done only when the need is obvious. Merely putting a plant into a larger pot will not necessarily restore an unhealthy plant. The cause of the bad condition should be sought. If it be due to dense matting of the roots then a repotting is indicated. Spring is the best time of the year for such adjustments.

Amongst the flowering plants which the writer has found most successful indoors are the primroses and petunias. They blossom persistently, sometimes throughout the year. Of the bulbs, success has been invariable with good hyacinths and the paper narcissus. Chinese lillies grow very fast but only occasionally have the flower buds escaped blasting by cool drafts. We have had indifferent success with Cyclamen, Chrysanthemum, Azalea, and Begonia.

Of the foliage plants mention may be made of the Kentia Palm, Aspidistra, Dracena (fairly successful) and Pandanus or Screw Pine. Among the trailing plants, English Ivy, Tradescantia and Trailing Asparagus are always successful.

If the beginner in outdoor plant culture will make a small selection from the plants mentioned and study their needs and reactions he will readily accumulate the fund of experience which will guarantee success and pleasure in his pastime.

The Most Useful House Plant

MARY F. BARRETT
Bloomfield, New Jersey

What is our most useful house plant? I will tell you some facts concerning it and you will be able to guess in a moment to what I refer.

This plant is so small that we can not discern the individuals, although we often see collections of them. It grows wild; but if we want to propagate it in our homes, and most of us do, we buy it in quantity usually at a grocery store. We purchase thousands at a time; but the price is only two cents. Its color is a grayish-white, not green, because it is a fungus; and it has none of the parts which we associate with house-plants. It can not be said to be in the least ornamental.

We take the best of care of it, but in the kitchen instead of the conservatory; keeping it first in the ice-box and then, when we want it to grow, in a warm room. We give it no light, but plenty of warm water and also sugar, an unusual diet for a house plant. Its life after it starts to grow is very brief, less than twenty-four hours. In fact we put it to a violent death by subjecting it to intense heat. Then we eat it, along with other things, and by that time we have so far forgotten its existence that if we taste it we complain.

A popular commercial brand of the plant is that prepared by the Fleischmann Company. If you break off a bit of their square cake, crush it in a little water and examine it under a miscoscope which magnifies it several hundred times, you will find two different kinds of oval or roundish bodies. The one with striations like a clam shell is a starch grain; the other, which is clear or has

a bubble in it, is the yeast plant. The starch grains are added principally for mechanical reasons, which will be discussed later.

We all know the final result of adding yeast to dough; but we cannot there watch the inside processes that go on, nor can we readily test any of the substances formed. It is easy enough, however, to make a more transparent mixture which will let us look behind the scenes. At the same time we can try other materials and various conditions, and can thus draw our own conclusions as to circumstances favoring or retarding the growth of the plant.

For these experiments we should get if possible six wide-mouthed little bottles of the same size, and some thin rubber tissue of the kind unpleasantly associated with dentists. In making up the contents of the bottles we may experiment with representatives of the classes of foods: starch and molasses as different carbohydrates, raw white of egg as a nitrogenous food, butter as a fat, salt as a mineral, and water. The following directions will show one way of treating the subject.

Make a weak solution in water of each of the first five foods, allowing one teaspoonful to nine teaspoonfuls of water. Put each solution into its own bottle, filling the bottle only half full. Into each put about one-sixteenth of a yeast cake and cover with a square of rubber, stretched a little and tied securely over the mouth. Mark the bottles with the names of their contents and leave them in the kitchen over night. If you have no rubber, cork the bottles.

In the morning set aside unopened the bottle which shows the most action and notice what is happening. The name of this process is fermentation. Of the foods tested this particular kind, then, is the best for awakening the plant's activities. Let us therefore throw away the contents of the other bottles, wash them and use four of them in an attempt to find out some of the conditions affecting this sort of fermentation.

We now need enough of the food solution for three bottles. The first one will receive yeast and will be covered with rubber and placed in the ice-box. The second will receive yeast and will be covered first with rubber and then with thick, dark paper arranged so as to keep out light, but not air. It and the third bottle, which is exactly like the one left over from the day before,

will be placed in the kitchen. The fourth, also to be placed in the kitchen, will consist of yeast put into the undiluted food, and will be covered with rubber.

In this set of experiments we have by no means represented all the possible conditions, any more than, in the previous set, we tried all the kinds of food. We will, however, be able to see whether an ice-box temperature and darkness combined affect this kind of fermentation, how darkness alone influences it, and the result of a strong food solution.

The next day look at the best three out of the five bottles. You have here two proofs of the presence of a colorless gas. Can we find out what it is? Here is a simple though inaccurate test, safe in this case but not to be applied indiscriminately in other experiments.

Four colorless gases are hydrogen, oxygen, carbonic acid gas (carbon dioxide), and nitrogen. Of course there are others, but for this test these four will suffice. The first two support combustion, will burn; the others do not. Let us, therefore, light a splinter of wood and hold it over the rubber, while we make an incision to allow the gas to come out. This position is necessary because some of the gases are lighter than air and rise rapidly. If the gas is one of the first two mentioned there will be an explosion or at least the splinter will burn more brightly. As nothing of the sort happens we will enlarge the opening and plunge the splinter down almost to the liquid. What is the result?

We thus have proved in two ways that the gas is neither hydrogen nor oxygen. The next thing to do is to find out whether carbonic acid gas or nitrogen remains. Of the two the former is the easier to test and we can make a check experiment, for purposes of comparison, by using the carbon dioxide given off from our own lungs.

Buy a little lime water at the drug store, as that is easier than trying to make it. Pour part of it into a low dish. If you breathe upon it you notice that a scum appears, and if you continue the whole liquid becomes milky. If you blow into it through a glass tube the end of the tube touching the lime water is crusted over. Now if you can find a cork to fit one of your bottles and a glass tube bent like a blunt, inverted V, you can easily make the gas do as you have done, namely, blow into lime water: that is, if fermentation is still going on vigorously. It will thus tell you

whether it is carbonic acid gas or nitrogen. Simply make a hole in the center of the cork, insert one end of the tube, so that it goes well beyond the bottom of the stopper, put the other end into a tumbler of lime water, take off the rubber and cork the bottle. There is no danger that the gas will escape when you remove the rubber, because it is heavier than air. It takes about half an hour for this experiment to work.

This gas is produced also by baking powder, and is used in making soda water.

Sometimes the rubber top, after a day or two, is sucked into the bottle instead of being inflated as before. This is because the rubber when stretched allows some gas to escape, although it does not permit air to take its place. After fermentation ceases there is a rarefied atmosphere inside the bottle, and the outside air forces in the rubber.

Another important substance produced is alcohol, and therefore we call this particular kind of action alcoholic fermentation to distinguish it from similar processes which produce different results. Unfortunately we can not show the presence of alcohol by a simple test, as we have just done with the gas.

If the scum on the top of the liquid is examined under a microscope it will be found to consist of yeast, most of which differs a little from the plants described before. Some, it is true, are just the same; but others have protuberances or buds growing from their sides. When these buds become almost as large as the parent plant they break off and start life for themselves. Thus the original number of plants is greatly increased. This is the way in which yeast is prepared for the market. It is grown in some sweet liquid, is skimmed off the surface, drained, partly dried, and mixed with some substance like flour whose starch will give the cake body, will act as a dryer and will make the yeast keep better in hot weather. You will find that the covering of Fleischmann's yeast states the particular kind of flour used in that cake. Dry yeast contains less water than compressed yeast. It keeps longer, but is slower in action.

But, after all, it is not the growth of the plant which causes this alcoholic fermentation, for it has been found that yeast which has been ground up with sand and then subjected to great pressure in a bag will give up a liquid which when strained and given the proper conditions of "food" and temperature will carry on

fermentation in the same way. It is impossible that any whole plants should survive this rough treatment and should afterwards grow and ferment; but in order to make sure that not even living bits of them escape, an antiseptic has been used which stops the action of living matter on sugar. As this has been proved not to interfere with the process, evidently the cause of alcoholic fermentation is a substance which is not alive, although it is produced by a living organism. It has been named zymase, and it is only one of several ferments found in this tiny plant. The others may help in this process or may work upon the protein (nitrogenous) matter of the dough.

If then its growth is not the cause of alcoholic fermentation, why are we so particular to give yeast the best conditions for reproduction?

Because, since zymase is produced by living plants, any increase in the number of these will lead to an increase in the quantity of the ferment and so in the amount of action produced.

Now let us compare the alcoholic fermentation which we have seen in its simplest terms with that which takes place in dough. The water of the experiment is represented by water, warmed to start the action, or by the water in milk. The molasses corresponds partly with the sugar, if any, partly with the sugar of the milk and partly with the carbohydrates of the flour. These consist of a little sugar and a large amount of starch. Starch, we found, is not acted upon by yeast; but unfortunately flour contains a ferment of its own called, diastase, which combines starch with water, making it into the particular kind of sugar best for the yeast. For that matter neither molasses nor any one of our ordinary sugars is exactly right for yeast. It has to change that sugar by another ferment which it contains, before zymase can begin to work.

There are a number of other substances involved in the making of dough. Wheat flour, besides its 76 per cent of starch and sugar, contains in small amounts water, gluten and other proteins, fats and oils, mineral substances, ferments and the inevitable bacteria. Gluten forms the tough but elastic part of the dough. If it were not for this the bubbles of gas would break through the surface of the loaf and the bread would fall. The stronger the gluten of a flour the more yeast is necessary to raise it. Upon it more than any other one thing depend the quality and flavor of the

bread. The mineral matters help to accelerate the processes which go on. The ferments and bacteria cause various fermentations, some favorable, like the changing of starch into sugar, mentioned above, and some injurious. Practically all of these flour ingredients affect the taste of the bread and all except the injurious bacteria are or make food.

Besides flour we may use milk, valuable for its water, sugar, fat and protein; eggs, containing water, fat and protein; and butter or lard, largely fat. All of these are foods and also add flavor. The principal value of salt is its taste. Its great fault is that it retards fermentation by yeast, and so must be put in last. It partly makes up for this bad trait, however, by checking the action of unfavorable ferments. Several of the foods just mentioned are acted upon by other yeast ferments than zymase.

In making bread it is necessary to distribute the yeast evenly or the bread will rise unequally. Therefore, we dissolve it in warm water and knead it into the dough. We leave it in a warm place because a temperature of from 77–95 degrees is the best for the action of the yeast. If we leave it too short a time the dough does not rise enough; if too long, the carbonic acid gas passes off and the dough falls. In the morning the bread is full of big bubbles of gas and we knead it again so that they may be broken into smaller ones and scattered through the dough. Thus we try for a bread with many little holes rather than for one with many large ones.

In baking, the yeast is soon killed by the high temperature; but the gas, expanded by the heat, continues to raise the dough in its effort to escape. Thus we need an oven hot enough to make a crust quickly and so retain the gas until the gluten has hardened sufficiently to hold the spaces. If the oven is too hot the inside of the bread, which heats slowly and to a temperature not much above the boiling point on account of the presence of so much water will be uncooked when the crust is on the point of burning.

In the meantime the alcohol, which boils at a lower temperature than water, has been helping puff up the dough, has softened the gluten so that it will be better able to hold the gas and has checked the action of the bacteria. This and a few by-products such as glycerine and oxalic acid either are evaporated or else remain in such small amounts as not to be detected.

Eventually the raw food materials are brought to that stage

of digestibility and attractiveness which we characterize by the word "done."

Bread has been the staff of life since pre-historic times; and since, because of the presence of wild yeast in the air, a mixture of meal and water ferments in the course of a day in the warm climates where history began to be made, we may conclude that raised bread is almost as old as the unleavened form. There are numerous varieties of it, different nations as well as individuals having originated certain types. It is the first food whose name you may learn when you study a new language and it has figured in the literature of all nations. Besides being the best known food it is probably the most popular in the long run, and by most people is considered indispensable to a meal. There is no waste in bread, and although it contains very little protein it yields perhaps the greatest amount of nourishment of any food for the least labor and cost.

And yet after all this time and experimentation, voluntary and involuntary, on the part of housewives, bakers, physiologists, and chemists, we are still in doubt as to some of the processes that go on and we still find a loaf of good bread a very difficult thing to make. There remain plenty of problems to be solved, and of a nature not to be despised by research workers. Let me leave for your consideration and solution a few of the questions to be answered in the future, as formulated by Robert Kennedy Duncan in "Some Chemical Problems of To-day."

What is the best yeast strain for each kind of bread?

What is the nature of the best soluble proteids for yeast food and what should be their proportionate quantity?

What mineral substances best accelerate the action of yeast?

What is the actual action of yeast in the gluten?

What is the proper temperature of bread fermentation?

What is the best way to nullify the action of maleficent bacteria and to accentuate or utilize the influence of bacteria that are beneficent?

Home Gardens

G. B. Goldsmith

In these utilitarian days when every new idea is met by the question, "Of what practical value is it?", there is probably no single activity which so well fulfils this requirement and at the same time satisfies the love of the beautiful as gardening. Even the plot of ground cultivated primarily for the sake of this same "practical value" has something very attractive about its straight rows and well kept paths, its luxuriant foliage or abundant bloom suggestive of the crop to follow.

The home garden may be planned primarily for either use or beauty, and not infrequently, where land and time are of less consideration, the purpose may include both phases.

But of whichever sort the garden may be, the unusual diversity of aim and the numerous opportunities for development along many lines make it a work especially worthy of encouragement. The constantly increasing call for summer activities shows conclusively that we are becoming roused to the necessity of providing occupation for children of school age during the vacation months, and certainly no more wholesome work could be found than that which gives direct contact with Mother Earth. Hoeing, spading, weeding, and raking give abundant exercise to all parts of the body and it is done under conditions that insure plenty of fresh air and sunshine. And it is perhaps no small consideration that the young gardener acquires a considerable respect for if not real delight in, a rainy day when he sees the transformation which follows.

For many people whose children are anxious to earn some extra pocket money beyond that which can be provided from the family purse, the garden offers a welcome solution to the problem of what they can do. The golf club, the polo ground, the shops which desire errand boys and messengers are frequently considered undesirable places for boys too young to have their habits and view of life thoroughly established. A home garden, well cared for, offers plenty of outlet for surplus energy and makes it possible for parents to know the whereabouts and companions of their children. Such parents should be, and usually are, perfectly willing to pay the market price for all produce, and neighbors are

more than glad of the opportunity to purchase any supplies not used by the immediate family.

It is an unusual child that does not like to help, and this work affords a splendid chance for the boy or girl to be of real use in a family where every contribution counts for much. If well planned even a small plot may be made to yield a very essential and wholesome part of the table supplies, and the young farmer learns many a good lesson in co-operation besides increasing his own self-respect. Along with this is developed a real appreciation of the value of labor and the much needed lesson of a right use of time. It is in such a family as this that special attention should be given to making the garden not only pay for itself, but also yield a profit. Otherwise the child will feel that he is a hindrance instead of a help, and will turn to some more lucrative, even if less desirable occupation. It is just here that the schools should prove their efficiency and give the pupil the necessary information, direction and even supervision.

One of the most interesting gardens is that which we may call the experimental type. Monotony is dulling in all things, and in our garden work added zest may be given by trying some one new thing each year. We thus have the pleasure of satisfying the various family tastes, of learning different kinds of crop management and, by no means least, what is best suited for our land. If only a single crop is raised, a part may be set aside in which to try a new fertilizer, a different insecticide, or a new method of cultivation. The boys and girls who belong to the potato or corn clubs might find this a particularly helpful and interesting kind of work.

For the child who has no need of the garden conducted for financial reasons there is pure delight and much fine aesthetic training to be derived from a flower garden. No one thing adds more to the general appearance of a house than its approach and immediate surroundings, and here again the children may co-operate by having a single bed or two of flowers for which they are entirely responsible; or, if the area is small, even the entire garden may be given to them. The fundamental principles of design, color, proportion and fitness to situation may serve not only in gardening itself, but in other work of the home or school. Color alone, of which the children are so fond, affords a field for con-

siderable training in aesthetic appreciation. From co-operation it is not a long step to a generosity which includes others besides the immediate group, and the children may soon learn to share the brightness of their gardens with others. To the sick and shut-ins or those who cannot have gardens of their own, no gift is more welcome than a bunch of flowers, and there is added a peculiar charm and sweetness when the gift comes from a child. This finds its reaction in the young lives and they soon find their own happiness in making that of others.

Another outgrowth from a garden of any sort is a proper respect for the property rights of others. This can be inculcated in no better way than by finding out through one's own experience what it means to possess and care for something quite entirely one's own.

The crops to be raised need careful consideration if any degree of success is to be attained. If flowers are to occupy our attention we must consider, (1) color. Flowers which in themselves may be very beautiful lose their charm when placed beside others which are inharmonious. Reds, because of their intensity and variety, need very careful handling. They invariably dominate the landscape wherever they are placed, especially if of the more brilliant tones. They are usually best set by themselves or with only white in the immediate surrounding. I well remember seeing a perfectly beautiful mass of bougainvillea its wealth of violet-red bloom completely spoiled by being directly beside a magnificent growth of poinsettia. Each in itself was gorgeous but together were most displeasing. If one wishes to separate masses of color or make borders for the beds, white sweet alyssum, candy tuft, and mignonette are especially good for this purpose. (2) Ease of cultivation should also be considered by the inexperienced gardener, for it is a bit discouraging to have many hours of labor rewarded by only a scanty supply of flowers, or to find that plants need such constant attention to produce satisfactory results that one's pleasure is materially lessened. A disheartened looking garden is very likely to engender the same spirit in its owner. Many of the flowers which are desirable from this point of view may be obtained in a great variety of color so that our color design need not be interfered with. Zinnias, verbenas, asters, portulaca and sweet peas offer almost every color, while phlox,

scabiosa, salpiglossis, poppies, and cosmos give a smaller range of variation. (3) The amount of space at our disposal will dictate the number and size of plants to be used. It is much better to grow a few plants which have plenty of room and look comfortable than to have a mass so crowded that we feel they are all choking each other, and we dare not attempt to gather any except those just around the border because we are sure that we shall break so many in the process of cutting one. (4) Arrangement is another factor of no small importance, for the prim rows and bordered paths resembling the gardens of our grandmothers give us quite a different feeling from the irregular masses and surprising flashes of color that greet us from behind a curve or from half-concealed situations in the shrubbery. It is of almost as much importance as color and proportion in creating that indefinable thing which we call atmosphere. Every garden possesses it and only by thinking of these various factors can one make the attractive, charming and restful spot instead of the fussy, heterogeneous mass that is dignified by the name of garden.

For a garden to be of fullest value there must be (5) a succession of bloom. So in our planning if we find that some plants stop blooming by the beginning of real summer others must be grown which will fill our mid-season days with flowers, and then will come the late bloomers such as cosmos and salvia. This knowledge of the exact season and duration of bloom will often help our color scheme, for by the time one flower begins to show its color its quarrelsome neighbor may be past its prime and clothed only in foliage. Many, however, last from early summer till Jack Frost nips them. (6) Abundance of bloom is also a most desirable characteristic for the ordinary garden and fortunately this is to be had in plants which are both easy of cultivation and of no great cost. Calendulas, calliopsis, French marigolds, cosmos, mourning bride, poppies, petunias, verbenas and ageratum will supply us with quantities of color through almost any kind of season. (7) The matter of expense need not deter even the child who must makes his garden pay from having a few blossoms. While fancy strains and new bulbs are often rather costly, many of the most satisfactory plants are of the cheapest. The seed catalog, one of the gardener's real friends, will help us to decide what we can use and still keep within the limits of economy.

If vegetables are to be our pride and joy we still need to make careful estimates of cost of seed, particularly if our garden must pay for itself, the amount of space we have to use, and the care of our different crops. The latter is of even greater importance here than in our flower garden, for while foliage may be in itself ornamental without the blossoms for which we hoped, we lose our point entirely if our vegetable garden does not develop properly. Foliage in place of blossom will hardly serve our purpose in a pea crop, but it may easily happen if we fertilize the soil too heavily. In our final choice the kind of land at our disposal, rather than fancy, should dictate the crop to be grown, for heavy, clayey soils can hardly be expected to yield the same results as light or sandy loam.

For the boy who has only a small plot of land, radishes, carrots, lettuce, tomatoes, (which can be trained on a stake), parsnips. and chard make excellent crops and give considerable variety New Zealand spinach, which takes up considerable space, gives such a continuous supply that it is well worth a place in even a small garden, and early peas, which may soon give way to something else, are always a delight.

Succession and companion crops are very interesting to plan and are quite essential if one is to get the most out of his land. Early lettuce and cabbage make a good combination since the former is all out of the way by the time the latter is of any size. Radishes may likewise be sown near beets, carrots, or parsnips for the same reason. Early peas may be pulled up after harvesting the crop and the same place be sown to beans or late peas.

In all the various possibilities of the home garden there is surely something to appeal to almost all children and I know of no other activity which offers a better opportunity for bringing home and school in touch with each other. The problems of the home should be brought to the school for help in their solution and the principles taught or ideas suggested at school may be worked out at home. Thus may children of all ages learn that "The garden is a lovesome spot."

Tomatoes for the City Gardener

Irving P. Bishop*

No plant grown by the amateur gardener gives better satisfaction than the tomato. It is hardy, tolerably free from insect enemies, and under reasonable culture yields a bountiful crop which can be used in the household either green or ripe. Fruit allowed to ripen on the vines is much superior to that purchased in the market, since the latter is often picked when immature and ripened during transit.

When allowed to reach perfect ripeness in the sun and served directly from your own vines to the table, tomatoes have a beauty and flavor which gives an added joy to meal time.

While they seem to prefer a loam, tomatoes will do well in almost any soil that is not actually wet and soggy. The amateur gardener should grow his own plants, since by so doing he may select such varieties as are best suited to his taste. There should be an early variety like the Earliana or the Wonder; a later kind like the Ponderosa for general crop; and it is a good plan if space permits, to test a new sort each year in the hope of getting better fruit, or plants better suited to soil or climate. For variety, the large Yellow Queen is a favorite with me. It is a strong grower, prolific, only moderately acid, and when sliced with red ones has an artistic value which specially commends it to madame's approbation.

Seed should be sown under glass or in the window box in March, for very early varieties, and in April for later. The young plants should appear in about a week; and in four or five weeks more should be transplanted to boxes so as to have the plants about four inches apart each way. Transplanting gives the plants more room and develops a stronger root system. As soon as danger from frost is past, which in Buffalo is about May 20,—the plants should be set out in the garden. The soil should be mellow and well fertilized with stable manure or a mixture of one part sulphate of potash, three of nitrate of soda and four of acid phosphate applied at the rate of 1000 pounds to the acre. Early peas, radishes and lettuce should at this time be nearly ready to harvest, and the tomatoes may be set among them. By the time the early

*Mr. Irving P. Bishop taught Nature-Study for twenty-five years in Buffalo Normal School. This article was written shortly before his death.

FIG. 1—Tomatoes supported on stakes and trellis Plant at left was over 10 feet high

crops are removed, the tomatoes will have become well rooted and be ready for cultivation.

If allowed to grow as they please, plants should be set about four feet apart each way; if supported, they may be three feet apart in the row with the rows four feet distant from each other. To give plenty of sunlight for ripening, the rows should run north and south if possible. Growth may be hastened by flat-planting. Dig a hole about six inches deep, put in a little stable manure and cover with earth to the deph of an inch. Lay the plant slightly inclined in the hole, cover with earth to the second pair of leaves and press the soil firmly down upon the roots with the foot. The base of the plant should now be about two inches below the surface. Water copiously and shade for two or three days with newspapers, green leaves or boards. In a few days the uncovered part of the plant will stand erect and will develop roots along the buried stem which give the plant increased feeding power and insures rapid growth and early ripening. After the plants are well established the soil should be kept mellow and free from weeds. If the plant is allowed to trail upon the ground, much fruit is wasted, the berries rot or are eaten by slugs, millipeds or wire worms. During a shower they are splashed with mud and rendered unsightly or even unhygienic. Therefore, most varieties of tomatoes will give better satisfaction if supported; and with the larger varieties support is essential. The support may consist of a light trellis or of stakes. If the latter are used, they should be seven or eight feet long, about two inches thick and set about a foot deep in the ground. As soon as the branches begin to appear pinch off all laterals and tie the plant to the stake with strips of cloth or raffia as often as it shows a tendency to fall away from the support. When the plant has reached the height of two feet it may be allowed to fork, pruning each branch as recommended for the main stem and tying until the plant has reached the top of the stake. By preventing the formation of laterals and suckers the energy of the plant is directed to the growth of a long stem and the formation of larger berries. Fruit begins to set on the vine about a foot above the ground and continues to form till the end of the season. With the larger varieties, there is no limit to the growth except the length of the season. In my garden, plants set May 28th reached the height of ten feet eleven inches in five months and set fruit to the height of eight feet. In the latitude

FIG. 2—A corner of the Tomato Garden. Plant in foreground was pruned to a single stem and cut back to seven feet high.

of Buffalo, however, nothing is gained by this excessive growth of stem, as berries will not ripen above the height of seven feet. It is better therefore, to pinch off the end buds soon after the vines have reached the top of the stake and thus compel the plant to concentrate its energies upon the development and ripening of fruit. Where killing frosts do not come till late October, nearly all the berries will ripen. If the mature green tomatoes are picked before frost and stored in the cellar like apples they will ripen slowly for a long time. Last season, fruit picked November first was served fresh on the table till the following February and was of good quality.

The tomatoes grown on the pruned and staked plants are smooth, clean, larger, and of better flavor than those grown on plants which lie upon the ground. The Ponderosas frequently attain a weight of 25 ounces or more and the Berg with me ripens berries weighing two pounds or more. Both are late, solid-fleshed varieties specially suited for late autumn and early winter use.

To secure early tomatoes, select an early variety, set strong, well-developed plants as soon as danger from frost is over, stake, and prune rigidly to a single stem. The early varieties are usually of a dwarfer habit for which a stake four or five feet long is adequate.

Molds in the Home

G. H. BRETNALL

State Normal School, La Crosse, Wis.

Molds are both our friends and our enemies. When the molds get into the garbage piles, the weed piles, old logs and brush in the woods, or any old trash that is thrown out they are our friends; for they tear this material to pieces and so clear the ground for further growth of vegetation, beside making the ground richer at the same time. If it were not for these, with the help of bacteria, the ground would be covered with the trash piles of former generations, and the dead stems of former plants, and we would have no gardens, farms or forests. It is wonderful when we think of it that such insignificant little plants as molds play such a large part in making life possible for us on this earth.

These little friends, the molds may become our enemies by getting into the house. We are glad to have them in most places

out of doors but in the house we very much dislike them. We are very conscious that these are our enemies when a common mold, Mucor or Black Bread Mold, gets into the bread box and spoils the bread.

As these molds live—as do most of the fungi—in the substance from which they take their nourishment they often are hidden from view and do their damage before they are seen or suspected.

These molds grow from little reproductive bodies called spores. These are in the air everywhere. It is hard to get away from them. I have found them in the air of a new building in which there had never been anything moldy.

To keep molds out of the home we must reverse the conditions that make growth possible. These conditions are: the spores above mentioned, moisture, warmth and the oxygen of the air.

To keep mold out of the bread box, then we must keep it dry and keep out the spores as much as possible. If the bread box is scalded or put over the flame of the gas stove the spores can be largely gotten rid of for the time. The gas flame burns them out quickly. One must be careful in using the gas flame thus so as not to damage the bread box. The temperature of the bread box is not easily regulated but the problem of keeping out the mold will be greater in summer than in winter.

This same kind of mold appears too on canned fruit and jellies. If the jelly is not well paraffined or is kept in a damp place the mold may get in and spoil the jelly by fermenting it. In the case of canned fruit proper canning will keep the mold out. Often a layer of mold is found on top of the fruit. This wastes some of the fruit and is anything but appetizing. It does not grow down into the fruit can very often because of the large amount of juice which is in the can and which contains none of the oxygen necessary for the molds growth. The mold on the top though, is very undesirable. It occurs in this way. The fruit is usually well boiled but the lid is put on cold or heated only by being placed on the range shelf. When the cover is brought to the jar it picks up spores from the air as it passes through it. Then there is some air in the lid. These spores and this air are screwed down into the jar. The spores grow and live on the fruit till the oxygen in the contained air is all used up. Now, on the other hand, if the lids are put into boiling water, the can filled level full of fruit, and the lid, hot and steaming, brought to the jar, the steam

of the fruit and the steam of the lid will drive out all air and spores from under the lid. There will then be no spores or air in the jar of fruit and no mold will be found. In my laboratory we have canned fruit in wide mouthed bottles with only cotton batting stuffed in the mouth of the bottle for a stopper, and it kept perfectly. We, however, were careful to heat everything enough to sterilize it and were careful to keep out all mold spores as well as all kinds of spores.

I have found this same kind of mold on tooth brushes which were shut up in a cabinet in a bath room. These brushes were some of those with holes back of the bristles, the kind which are the most sanitary for the holes help the brush to drain and dry out. These brushes looked dark with age at first glance but on looking closer I found a little black mold plant in each hole. I could pull these out each having the shape of the hole. I found other mold plants between the bristles Tooth brushes should be hung out where they can dry. Any cover put on them should be open enough to allow them to dry properly. If the bath room is kept well cleaned and free from dust the tooth brushes can be hung out free so that they can dry quickly Here the moisture gives the condition of growth and the reversal of the condition keeps the brushes free from mold. Moisture is the one big factor to consider in keeping the molds out of the house. This is seen in bringing the clothes in from the line before they are dry and leaving them piled in the clothes basket. We say they mildew. This is a mold which stains the clothes and you cannot wash the stain out if it gets in very badly. If you take the stain out with chemicals a hole soon appears for the mold has used the clothes for food and weakened them. These molds can live on almost anything around the home. Sometimes we find them in the door mat.

A place where mold is often found and where it does great damage is in the sills and rafters under the house which make the ceiling to the cellar. This mold lives in the rafters and does its damage before being seen. Where there is a great deal of dampness it will show on the outside. In mines where water drips down on the timbers supporting the roof of the passages it hangs in great white festoons like masses of snow. To prevent this mold in the under part of the house the foundation should be high enough to take the house well up from the ground and the

cellar should be drained and kept dry. Such care will prolong the life of the house indefinitely.

So anywhere in the house we may look for these little enemies of ours which destroy the things we want. Keeping things dry, and well open to currents of air, which means the same thing, and looking out for spores where we can tends to keep the molds out. They grow best in summer when the temperature is above 80 day and night. and when the air is moist. Then we have to show the most vigilance.

The Best School Garden I Know

MARGARET KNOX

Principal of P. S. 15, Man., 728 Fifth Avenue, New York City

You will not agree with me in this I am sure for when you picture the best garden anyone knows, you immediately think of well-trimmed grass plots, a few shade trees, attractive looking shrubbery, and always a wealth of garden flowers.

The garden I know has none of these, and yet, for all that, it is the very best sort of garden because of the very useful life it leads.

Let me describe it. It is down in the most crowded part of a very big and very crowded city. It is between two very high brick walls and the only shade tree that it is acquainted with is one poor ailanthus tree; all the rest are just trunks of some monarchs of the forest, cut down long ago and brought to this big crowded city to be used to attach pulleys for clothes lines reaching out from the tenement house windows on both sides of the space left between the houses crowded on two streets.

This garden space is in the yard or play space of a big public school which 3200 boys and girls attend. The whole space is about the size of a city lot 20 x 100 feet but the garden occupies only a little strip down each side of this lot and a little square bit at the back where the ailanthus tree stands. This tree was left there by request when the residence was torn down to make this play space for the children of this big school. The little square plot of ground with the ailanthus tree standing on it used to be the backyard of an old fashioned city house

"How could anyone have a successful garden amid such surroundings?" I hear you ask. Well, here is your answer.

The garden space is small and there is not a great deal of sunlight to make it thrive, but there are big-hearted people interested in our garden and the sunshine of these warm hearts and ready hands would make any garden successful.

The teachers of this school and their friends have all taken an interest in making this garden the best that we know, for, many of the children who play in it have never seen any other. And so we have brought into it violets and columbine, anemones and spring beauties; Jack-in-the-pulpits, hepatica, dog-tooth violets and ferns. All these in their season have introduced themselves shyly to the eager children who were permitted to look but not to touch these frail little visitors.

The next season the children watched anxiously for the return of the flowers that had come last year and oh, what rejoicing when they were rewarded with a glimpse of the baby leaves peeping forth. When they saw Jack get up again in his pulpit and when they heard him preach from it they learned his text by heart, and this was it: "Make the best of little things." Then his sermon was full of the good things that this little garden has done in the years that it has been growing.

He reminded them of the Arbor Day celebration some years before when they had put in a baby tree, and he pointed his finger to it and said, "There it stands growing, not very big and strong like a country tree, but still smiling and cheerful, making the best of its little corner in our garden.

He reminded them of the poor tired bird, a flicker, making its way southward one breezy October day, that had dropped down into our old ailanthus tree for a moment's rest and how frightened it was until it discovered that our boys and girls were all friends, not foes, and as real bird-lovers they had helped it away on its southward journey.

He reminded them, too, of last spring's beautiful garden. He told how the children had saved their pennies usually spent for chewing gum or candy and that all the children from the kindergarten to the highest class of big boys and girls, fourteen years old, had some share in buying bulbs in the fall; then how the boys in one of our classes dug the garden and put the bulbs carefully to bed for the winter.

Then spring came and oh! what an awakening! On they came, —snowdrops, narcissus, tulips, jonquils, daffodils, hyacinths,

until this little "Best Garden in the Whole World" was ablaze with color, and rich with perfume.

All the boys and girls came and went in this garden with as much joy in it as if it were an Italian garden or one of the exquisite French parterres, or some beautifully planned park. The door into the street was left open and the mothers came flocking in with their babies in their arms to see and to smell the flowers. Some had tears on their faces as they thanked the teachers and the children for this lovely little place that reminded them of their childhood home in some garden spot of far away Europe.

And so, dear readers, we think that our garden, because it is so tiny and had so little opportunity for growing big and beautiful, and, because our children make the very best they can of it, is—"The Best School Garden We Know."

Excerps from Letter Accompanying Article

The school is a very big elementary school of 3200 boys and girls mostly foreign born. Russians, Poles, Hungarians. Austrians, etc., in the most congested neighborhood of New York City and yet we have found it possible to make a little garden and to have it felt as an influence both in the class-room and in the homes of these poor children.

Of course, such a garden as I describe, would seem the "best," only to those, like myself, who are struggling against great odds to make nature real to our dear children who are brought up among tenement homes, narrow streets, and altogether squalid surroundings.

If it is of any interest you could add that Public School 15's favorite book is Frances Hodgson Burnett's "The Secret Garden," and that the children have dramatized and play the garden scene very well.

Also that we have a Burrough's Nature Club and enjoy looking up answers to the Burroughs questions every month as much as any country children.

Very truly yours,

MARGARET KNOX,
Principal.

To Takoma Park—A Self-Explanatory Letter

It was the joy of our lives to be once more "hitting the trail," lustily as ever, Sunday last, under the brave lead of one who started the community hike here, and who, after three months wanderlusting in other lands must rejoice to find that a few brave scouts have kept up the good work here and made of us "some hikers." And right here let me say, John Boyle, that was some hike you gave us last Sunday. Two hundred and fifty people will bear me out in the statement that it takes a gospel measure of grit and strength to do an eight mile stunt in one afternoon. That your walk lengthened into a two-part affair, moonlight and daylight combined was, I judge, as much a surprise to you as to those of us who had such a jolly good time going Indian file along the beautiful, winding way of the Northwestern branch.

Now I must stop off to say something of the rejuvenating effect of a wanderlust. When our little world grows old and gray in our sight we need to go out where the skies are a flawless blue and the flowers bud and blossom still. When we are a bit stale a wanderlust is the place to find that freshness of feeling, the gift of women and men of genius and culture whom Hamilton Mabie describes as those who get the most out of life and develop their inner resource. A trip back to nature assuredly increases our zest for work, deepens our delight in life and helps us to keep that innate freshness and charm so essential to all real culture.

Truly it is wonderful how the interest in the Community walk here has grown. Not only residents but many transients have availed themselves of the privilege of joining the band for a mid-week or Sunday afternoon walk, and the magic of outdoors has slipped about them and they have come not once but many times again. A young man of my acquaintance purchased a wheel at the beginning of the season and thought to learn something of the surrounding country in that way, but he went once with the hikers and it's all up with the bike now for that has been relegated to the woodshed and seeing the country with a lot of enthusiastic hikers is deemed far preferable People have joined our ranks from far and wide. We know no North, no South, no East no West but everyone is welcome and not the least of our pleasure in hiking has been meeting people from other sections of our beautiful land.

I can't begin to enumerate all the beauties of that last walk. The smooth roads, the rough trail through the woods, the blue skies, alluring September sunshine, pasture lands, corn fields, turnip patches, old orchards, wood piles and old homes all had their place. Some of those well-kept fields just conjured up a picture of the Angelus. Possibly the best of the walk came when in leaving Burnt Mills in all its picturesqueness we made in going down stream a little picture of our own. What a jolt the camera man's heart must have gotten in snapping such winsomeness. Over the glen was falling a soft light, whitening the spick-span grayness of the big rocks and the little, the rugged and the smooth, a foothold for pattering feet that now picked their way so daintily mid-stream. Such a picture! Every man seemed helping some fair maid of the party to safety. The background of this pretty scene was the red and gold of dogwood and the hickory. The laughter and the jest of many a pretty girl rivalled the low gurgle of running water. Everybody had an exciting time in a wild endeavor to get over the rocks gracefully and then we struck a trail that was, indeed, some trail. John Boyle, in school days you must have taken for your motto "Find a way or make one." Yet I wont quarrel with that trail since it followed the stream, and water they say goes like a woman by intuition. The trail went up, and down, round and about; it beckoned and it stayed, and when you thought you had lost it you'd really found it and when you were sure you'd never see it again there it was stealing along in front of you as demure as a maid. When you had forgiven this trick of the trail there was a giant log to scramble over, a river Styx to cross, or a miniature Alps to climb.

You made us slink, John Boyle, like Indians through the thicket and we never dared to stop and look around. No watchful waiting obtained here for watchful running was our slogan and failing to keep alert eyes on the job we went down in a heap and kissed Mother Earth surreptitiously. All the while twilight was surely creeping on, the stream going to sleep in its sluggishness and the quiet woodland where laurel and azalea had gone to seed, was enticing stragglers to tarry for a whiff of maidenhair fern and fragrant spice wood. Long ago our weary arms had parted with our bundles of goldenrod, asters, daisies and heaps of sword ferns.

Night had come upon us with a jump. We thought the deep woods had merely shut out daylight for a while, but emerging

from the thicket into the open a bright old moon had the laugh on us, winking through the clouds. "My stars," said he, nodding to his attendants, "those folks wont get home till morning!" The little boy, ambitious at home to shoot lions, and slay tigers fretted audibly when he realized the distance separating him from home and mother. Doleful voices sang "Where is my wandering boy to-night," and a slighted member of the feminine gender pouted: "How about the wandering girl?" Somebody abused the never ending stream, calling it the River of doubt and sang "Shall we gather at the River?" Nobody dared breath the word supper lest there be cannibals in the crowd. A fair maid thought she spied a bear which proved on closer acquaintance to be a man with a big stick. He called himself Moses and was pleased to lead her and a few others out of the wilderness. College yells, war hoops and any kind of human cry sounded good to timid souls, and pocket flashes did their work pointing the way

You will readily believe the old bridge and the long straight, road looked good to us as we left behind us the forest primeval. Beneath the old moon and glow of the twinkling stars we shook hands and roll was called. Takoma Park, where we were to take the cars, we were informed by a passerby, "was just a piece up the road." We set off briskly but when we had gone what seemed to our tired limbs a couple of miles we ran across a belated caravan and finding we still must cover a mile and a half before reaching Takoma we lost faith in the "piece up the road," and some of our party urged by aching limbs had a strong notion of stopping off at the Takomo Sanatorium for repairs. Never did lights glisten more nor appear more welcome than the bright illumination of Takoma calling us car-ward. After we had boarded the car we were surprised to find everyone looking so well and happy, after our thrilling adventures. Those who thought regretfully of broken engagements for that evening, of Cupid lurking in the cold for somebody who had failed to come home at the apointed hour, said apropos the wanderlust "Never again"—but next day were asking "When's the next hike and who's going to lead?" Soon, John Boyle, I trust you'll furnish us with a similar adventure not quite so long nor strenuous, and we'll prove we are "some hikers yet."

M. J. Moor

Washington, D. C.

Reports of Sections

The officers of the Nature-Study Club of Indiana of Indianapolis, Ind., are as follows: William Watson Woollen, president; Dr. Frank B. Wynn, vice-president; Leora W. Pellette, second vice-president; Florence W. Howell, secretary; Dr. James A. Moag, treasurer; Board of Directors, Robert W. McBride, chairman, Willis S. Blatchley, Edward N. Canis, Judge W. W. Thornton, John F. Habbe, Elizabeth Downhour, Etta S. Wilson.

The President writes:

"The first of January, 1916, will be the ninth anniversary of the organization of our Club. It now has about one hundred and fifty substantial members and I have a feeling that it has accomplished much good in this community."

Chicago Section

The following are the names of the officers of the Chicago Section of the Nature-Study Club: President, Dr. H. Pepoon, Lake View High School, 3842 Byron St.; director, Mr. Worallo Whitney, Hyde Park High, 5743 Dorchester Ave.; secretary and treasurer, Emma J. Heerwagen, Manierre S., 1118 Loyola Ave.; Chairman, North Side Division, Frederick W. Plapp, Schurz High, 4140 N. Keeler Ave.; secretary North Side Division, Miss Margaret Powell, Cleveland S., 908 Leland Ave.; chairman South Side Division, Miss Rebecca Freeman, Taylor S., 1528 E. 65th St.; secretary South Side Division, Miss Sue J. Reid, Revere S., 1356 E. 62d St.; chairman West Side Division, Harold B. Shinn, Schurz High, 3822 Lowell Ave.; Secretary West Side Division, Miss Elizabeth G. Dimmer, Andersen S., 3116 Palmer Sq. Blvd.

We had a very successful spring season. The following being the places visited:

May 8—New Lenox, Ill. Higginbotham's Woods. Leader, Professor Worallo Whitney.

May 15—Thatcher's Woods. Desplaines River. F. W. Plapp, Leader.

May 22—Ft. Sheridan. Afternoon trip.

May 31—Fremont, Ind. Leader Dr. H. S. Pepoon.

June 5—Beach, Ill. Leaders, Dr. Pepoon, Dr. Grant Smith, F. W. Plapp and H. Shinn.

June 12—Palos Park. Leader, Dr. Moffat.

June 19—Hazel Crest. Leader, Professor Worallo Whitney.

At each of these places a wealth of flowers and trees abounded. A large attendance helped to make it a successful spring season.

During the fall we had three successful trips. One to Miller's, Ind.; one to Winthrop Harbor, Ill.; last trip to Thornton.

Several other trips were planned but had to be abandoned—owing to the hoof and mouth disease—which prevented our tramping through the woods.

The following is planned for the winter.

Personally conducted trip through the Field Museum, December fifth.

The eighth of January, lecture on birds, Mr. Wager.

February the fifth, illustrated lecture on Wild Flowers, Dr. Pepoon.

March the fifth, illustrated lecture on Mushrooms, Dr. Moffatt.

The president of the Nature Study Society of Rockford, Illinois writes: "With great regret and profound sorrow, I inform you of the passing of Norman E. Nelson, September ninth, after a short illness, aged eighteen years. He showed rare promise as a naturalist and a brilliant future was conceded him and he was especially interested in the preservation of wild flowers and never missed an opportunity to champion their cause. His place as secretary of the Nature-Study Society can never be quite filled in the same way.

As to our activities, permit me to enclose program for the season.

PROGRAM OF THE NATURE STUDY SOCIETY OF ROCKFORD
1915-1916

June 28—Social meeting at the home of Mrs. H. M. Woodward.

July 17—Social meeting at the home of Mrs. A. S. T. Ogilby.

Aug. 14—Field trip to Fair Grounds Park: Herbaceous plants of merits.

Sept. 4—Field trip to Devils kitchen; general interests.

Oct. 9—Field trip to the Meadows and streams of Cherry Valley.

Oct. 18—Life under the surface film. Rev. P. H. Roth.

Nov. 6—Field trip to Mandeville Park.

Nov. 15—Honolulu as seen by a nature lover. Mrs. Chandler Starr.

Dec. 4—Field trip to Black Hawk Park. General Interests.

Dec. 13— Rev. Fulton.

Jan. 8—Field trip, Sinnissippi Park. Winter birds.

Jan. 17. Game birds and birds of prey. Al. Madsen.

Feb. 5—Field trip to Black Hawk Park: Camp fire reminiscences.

Feb. 21—Symposium of bird committee.

Mar. 4—Field trip to Spring Creek. Pond life and general interests.

Mar. 20—Program by Geology Committee.

Apr. 1—Field trip to West Side Cemetery: Bird migrations.

Apr. 17—Program by wild flower committee.

May 13. Field trip to Crow's nest: Warbler migrations.

May 15—Annual meeting at home of Mr. and Mrs. Worthington.

June 3—Trip to the Pines near Oregon, Ill.

We are publishing annual with constitution and by-laws, officers, and articles published weekly in local Sunday paper on various topics. We are still publishing weekly seasonable topics, proceeds of these go into general fund.

Compiled preliminary list of wild flowers of this region.

Under preparation: Shrubs of Rockford and vicinity.

Under preparation: Birds of Rockford and vicinity.

The Park Board has granted the Nature-Study Society use of two rooms at Mandeville park for museum purposes free of charge. The museum will be open to the public twice a week. The first collection, mostly geological, of several hundred specimens was donated by Peter Paulson of this city. Several more collections are to be donated shortly. Membership dues have been raised to one dollar per annum.

Officers: Paul B. Riis, president; Gertrude Thomas, secretary; Directors: Mrs. C. Albin Nelson, chairman; Mrs. A. S. T. Ogilby, Mr. C. C. Stowell, Miss Eunice Beatson, Miss Sara Long, Miss Jenny Waldo; Committees: House committee, refreshment committee, membership committee, bird committee, wild flower committee, tree committee, shrub committee, geology committee, Entomology committee.

The present officers of the St. Louis section of the American Nature Study Society are: President, Mr. B. G. Shackelford; secretary-treasurer, Carolyn Lefferty; executive committee, Miss L. R. Ernst, Mr. W. J. Stevens; members national council, Mr. H. C. Drayer, Mr. J. A. Drushel.

Here follow some sample Announcements of their field trips.

St. Louis Nature-Study Society

The Nature-Study Club will spend the day of October 12, 1915 at Allenton and Fox Creek. Ten trip tickets good for ninety days can be purchased for $4.25. A single round trip fare is $1.20. It is suggested that the members organize themselves into groups of five. The Frisco train leaves Union Station at 9:25 A. M., Tower Grove at 9:34 A. M., returning leaves Allenton at 4:33 P. M.

The party will walk to Fox Creek one mile from Allenton by wagon road. On this walk note the New England asters, rudbeckias, goldenrod, cup plant, nightshade, ironweed, heliopsis, white asters. Do not fail to see the shed in which tobacco is cured. Also observe the tobacco patch near Fox Creek.

Lunch will be eaten at Fox Creek. Bring drinking cups. Immediately after lunch a discussion will be made of the St. Louis storm of August 20. Leader, Mr. B. G. Shackelford. Reports by members are solicited.

Note the ripple marks in the limestone quarry. What are ripple marks? How made? How old are these?

Note the work of the August flood. Good observations may be made by walking up Fox Creek flood-plain sixty rods. Observe the digging power of running water.

Near the quarry is a good example of a landslide recently made. Estimate the number of loads (cubic yards) of earth moved.

At Fox Creek there is good opportunity for tree study. Why not continue your oak study by beginning an acorn collection?

Before leaving Fox Creek those wishing to do so may visit the grave of Mr. Geo. W. Letterman, who was our leader on several Allenton field trips

On the return trip from Fox Creek it is suggested that those who wish sumac, goldenrod, and asters for bouquets follow the wagon road up the hill near Allenton.

Mr. Shackelford thinks the "chiggers" may be on a vacation. Is he right? The Allenton cicadas are unusually tame. How does the cicada sing? Can you prove your answer?

Thirty members attended the Loch Lin walk. Four new members were received at this meeting. The present membership is 115. Several more can be accommodated.

Any members desiring to make the Onandaga trip sometime in November should notify Miss Lefferty before October 8, 1915.

At the request of several members the evening of October 8 will be given to a lesson on the stars of the first magnitude and to several of the important constellations. The members will assemble at Delmar Garden at 6:30 P. M. Dr. J. W. Withers has kindly consented to be the leader of the section for this meeting. If the evening is rainy or cloudy the above trip will be postponed to October 15, 6:30 P. M.

St. Louis Nature-Study Club

The Nature Study Society will make an excursion to the Chain of Rocks for landscape study Saturday, October 23, 1915. The party will leave Baden

station of the Municipal Railway at 10:15 A. M., and members may return at 12:15 or later.

Four views will be studied as types:

1. The river from its bank.
2. The bluff and park from the river bank.
3. The river and general landscape from the park on the bluff.
4. The agricultural landscape looking west from the bluff north of the park.

The park offers opportunity for the study of landscape design. The other views are largely natural. The following aspects are recommended for observation:

1. Colors of water, sky, clouds, trees, herbage, and tilled fields . Effect of different lights.
2. Reflections of sky, clouds, trees and shrubs in water.
3. Motions of river, clouds, boats, birds and tree-tops.
4. Forms of outlines of individual trees, shrubs, hills, clouds and masses of vegetation. Relation of same to each other vertically and horizontally.
5. Shadows on water, grass, earth. Effect of shadow of both casting object and reflecting material.
6. Design as seen in park. Lay out of roads and paths, planting plan, material used.
7. The effect of agriculture on landscape: of tillage, fences, crop colors, roads and farm buildings; of thrift or neglect.

The appreciation of landscape is largely personal depending upon the observers temperament, capacity, and training; but it is believed that a much keener appreciation can be developed in most young people through the agency of the school; and, to consider the principles involved Mr. Dougan will lead a discussion during the lunch hour. Questions will be welcome.

Thirty-five members attended the Allenton meet October 2, 1915. A perfect day contributed much to the success of the trip. Twenty-two people attended the star lesson on the evening of October 8, 1915.

Mr. L. M. Dougan will review and continue the star study begun October 8, 1915. The place of meeting is Harris Teachers College, the time Tuesday, October 26, 1915, 7 P. M. All who may be interested in this line of work are urged to be present. It is hoped that this work may be continued through the winter.

Book Reviews

Propagation of Wild Birds, by Herbert K. Job. Doubleday, Page & Co., 265 pages.

The appearance of a book like this indicates the arrival of an interest in bird propagation such as Americans, at least, have never before experienced. And Mr. Job is particularly adapted to its writing. As director of the "Department of Applied Ornithology" of the National Audubon Society he has been able to study and compile the methods of successful wild-fowl breeders,

as well as to present the results of his own years of experience in the rearing of game birds of various sorts.

The general nature of the book may best be shown by presenting in brief the substance of the material dealt with in each of the three parts into which the book is divided, as follows:

I. Methods with Gallinaceous Birds, and Others.

Here is discussed in detail the general methods holding for all birds of the family, such as for example, the problems of hatching, brooding, securing stock, protection against vermin, diseases, etc. Then follows, as a type, a detailed account of the method to be followed in quail propagation with instructions covering all the steps. The completeness of the treatment is indicated by the fact that these instructions alone cover some forty pages of the text. Succeeding chapters discuss the application of these principles to the rearing of wild turkey pheasants, pigeons and doves, and some foreign gallinaceous birds.

II. The Propagation of Wild Waterfowl.

Detailed instructions are again given, in this case covering the rearing of water loving birds, especially the wild ducks, geese and swans. Wild duck culture receives the major consideration, and rightly so, considering the greater number of species and the consequent greater possibilities. There is presented not only the writer's experiences but those of many other successful breeders. This fact adds greatly to the value of the treatment in as much as it thus becomes a compendium of the modern knowledge bearing on the subject.

III. Methods with Smaller Land Birds.

This portion of the book, though least in extent, is not so in interest and importance. It deals with the smaller birds which may seek nesting sites near the home, and covers such points as types of bird boxes, their placement, and protection; the uses of shrubbery, feeding stations, drinking fountains, protection against vermin, etc. The treatment is not only practical in its suggestions, but interesting to read.

Abundant illustrations throughout the book add much to its value.

That the book will meet the need of those who desire special information on the problems with which it deals is certain. That it will stimulate to a wider interest in the propagation and protection of wild birds is equally certain and altogether desirable.

R. E. W.

Chemistry in the Home, Henry T. Weed, Manual Training High School, Brooklyn, N. Y. 7 + 385 pages. 13.5 x 19 cm. Cloth. 1915. American Book Co.

Chemistry books are written usually for advanced high school students, but this text aims to meet the needs of those who elect chemistry in the lower classes of their high school course. The author has omitted much of the theory usually found in chemistries, and has kept the language and the style of treatment simple enough to suit younger minds. A large fund of information concerning the chemistry of everyday things related to the home and to industries is given in an interesting way. Each chapter ends with helpful exercises and summaries. Formulas, equations and valence are condensed into one chapter of fourteen pages. The illustations and descriptions of processes, like salt making, baking powders, oils, fats and soaps, textiles, dyes and dyeing, sugars, starches, paper making, glass making, etc., are clear, detailed and easily comprehensible to the young student. The subject of foods, their preservation, relative cost and nutritive value is treated in such a practical way that the student can apply directly in the home the knowledge gained. Laundry chemistry and the chemistry of cooking each receive a share of attention. Such texts are in demand in present day teaching, for they awaken the interest of boys and girls in the subject by a clear application of principles to the home and community life.

C. F. P.

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Through the courtesy of the school authorities of Los Angeles, Cal., I have been able to obtain a great number of photographs depicting the activities of the schools of that city. Among these is the one enclosed, which shows four thousand school children from Los Angeles, on the sea beach near the light house at Point Firmin, Cal., engaged in Nature-Study. This is such an excellent photograph and is illustrative of such an interesting phase of Nature-Study in the public schools, that I am taking a chance on your being able to use it either on the cover of your publication or as a frontispiece without an accompanying article. Should you desire a write-up of this particular expedition or of some phase of the work in Los Angeles, I shall be pleased to send it to you.

Very truly yours,
THOMAS J. DAVIS.

On the Training of Teachers of Nature-Study

R. E. WAGER

That a study of the world of Nature should be a part of the education of the child has been admitted since the early reformers pled for a more natural method. That our present system provides for such direct contact with Nature as our modern knowledge advises is far from a fact. The enthusiasm of a quarter century ago, with the belief that at last the touch-stone had been found, has waxed and waned, and the educator betimes pauses to re-examine the basis for his faith in it. For this test has he summoned his biologica., pedagogical, and philosophical principles, in order to give the thing a thorough inspection There must be no mistake. And out of it has come a renewed belief in Nature-Study as a funda-

mental requirement for the normal development of the child intellectually, and highly advisable for his growth physically, since to study Nature means to live out-of-doors with her. Nature-Study must be a part of the scheme of things by which the child is stimulated to educate himself.

This re-establishment on a more certain foundation means, certainly, that teachers must be prepared to deal as intelligently with Nature-study as with arithmetic or spelling. I shall attempt to point out some ways in which such preparation demands particular attention.

The placement of the new foundations are, of course above the old. The renewed interest in Nature-Study as a necessary factor in education has its origin in the study of the child himself; in his instinctive interests, and his physical needs for an out-of-door life. There is no longer a question as to the value of the subject nor the desirableness of its universal ntroduction, in some form or another into the curricula of the schools. The largest and most ponderating problem concerns neither the subject, not its pedagogical value, but the teachers thereof. The need is apparent.

For the outstanding criticism, and the conspicuous failures have been, as they must ever be, the result of poor teaching. On the other hand, signal successes, large results, and commendable discoveries have been brought about by good teachers, qualified both by interest and training to deal with the subject. It is obvious then, that the preparation of the teacher is the largest problem with which we have, in the immediate future, to deal.

At the outset, that it may emphasize the points later to be made it is desirable to call attention to a source of error commonly found in the minds of those concerned with the problems of education. Many such are outspoken in their condemnation, not so much of the subject, as of the manner and results of its teaching. And, when you think about it, nothing other may justly be expected. They complain that the teaching is fragmentary, poorly organized, lacks content, and is uninterestingly presented. These criticisms are too frequently true. How, in fairness, expect otherwise? The materials of Nature-Study are drawn from a very large field—from biology, astronomy, geology, chemistry and physics—and without very broad training the immature teacher, attempting to follow an outline, is speedily and hopelessly lost. She has had possibly a year, or, at the most, two, of special training beyond her high

school. Her life experiences have been exceedingly limited. As a result she is unable to view with understanding these lessons suggested in her outline, or to see them in a perspective of depth, and consequently misinterprets the significance of many lessons, emphasizes the unimportant elements to the submergence of the principle toward which the content of the lesson points. Not only so, but in her hopeless lack of experience, surrounded by a world which she does not understand, she falls back upon the book as her only refuge. From it she obtains her ideas, and toward it she points the pupils under her charge. Outside her door the big world is waiting. So it comes about that she does all the investigating—in her books; and the pupils lose, probably forever, the opportunity to use their own eyes, and exercise their own mental powers, under the guidance of one to whom the great out-of-doors is not entirely a closed book. Too often, indeed, the teaching is badly done.

We need to push this point still further. Unlike the three R's the subject of Nature-Study has, in the past been but fragmentarily presented, if at all, so that the teachers of to-day have not had childhood guidance and instruction in it. They have not grown up under the stimulus of the idea that its pursuit and mastery in at least a small way, is as essential to an education, as, let us say, arithmetic, grammar or geography. The error to which I made reference, consists in believing that good teaching of the subject is uniformly possible with the limited training and experience of the average grade teacher. The subject has not yet acquired the historical momentum necessary to carry it convincingly into the curriculum. It is there, in many cases, by suffrage, and we must not deceive ourselves as to why it is so.

Note, furthermore, that quite universally, by county and state authority, are minima of special training being set up. The time is not distant when the high school graduate, not to mention him from the eighth grade, can no longer get a "job" teaching save he follows with at least a year, or, in many cases, two, of special and professional training. That the time required in this training shall be increased with the developments of the future is certain. Contemplate also the marked ebb in the wave of enthusiasm for instruction in agriculture, which is after all, Nature-Study, and you must admit that the outlook for the future is most encouraging. We must turn our face toward it.

Accepting these facts, one is driven to the conclusion that the training of the teacher is the most fundamental element of the problem with which we are dealing. Upon it depends the establishment of the subject upon a sure foundation. To this then attention may now be directed. I shall point out, necessarily but briefly, some of the necessary elements in that training. To point our minds definitely toward it, let us make the inquiry:

Of what then, ought this training to consist?

Of the reply I would make a division into two large topics. Such training should consist, first, of a study of the theory, or the "why" of the thing; and, secondly, of the practise, or the "how" thereof. By the first I mean the discovery in the nature of the child of the reasons for bringing him into contact with Nature; and by the second, the study of Nature, in order better to understand the world in which we live, and of the methods and devices best adapted to stimulate children to do the same. There is need to enlarge upon these points, and we may attack them in order.

That the most convincing argument for the introduction of the subject is found in the instinctive interests, and the mental needs of the child for multisensory training, has already been suggested. Since Rousseau pled for the restoration of the first twelve years of life to contact with Nature, to be taught by her, and to learn her laws first-hand, many others have followed in the same avenue of thought, tho with different ends, and have insisted that our early school life is too formal, too uninteresting, too deadening of the child's mental keenness, too confining. Too little appeal is made to the instinctive interests, and too much emphasis laid upon the acquisition of adult ideas. These conditions have evolved out of the acceptance of the doctrine of formal discipline, now, fortunately slowly losing its hold upon us. Then too, as our modes of life have increased in complexity, and our cultures have expanded, it has seemed necessary to insert into the curricula now one, then more of the various studies which have imposed themselves as being essential to the fitting of a child eventually to take his place in society. As the pressure has increased these increments have been forced lower and lower in the grades, and instruction has become more and more formal and exacting. All of this has caused us to overlook the age-long accumulation of a mental and physical momentum back of the evolution of the child, and against which this formalization of the curriculum certainly operates. Child life

inherits a tremendous racial impetus for the open; for fields and woods and streams; for birds and flowers and trees; for trail and tracks; for play and sport, learning betimes, much which may later furnish a basis for, and give meaning to the generalizations and principles taught in school. Learning by living through play, through activity and contact, under the impulse of deep-seated interests, is the open sesame to childhood education of the future. In that Nature-Study must play a conspicuous part, "We must teach Nature, although the very name is ominous" says Hall. "But we must not in so doing, wean still more from, but perpetually incite to visit field, forest, hill, shore, the water, flowers, animals, the true homes of childhood in the wild, undomesticated stage from which modern conditions have kidnapped and transported him. Books and reading are distasteful, for the very soul and body cry out for a more active, objective life, and to know Nature and man at first-hand." The first great need, is, then that the teacher should understand the child himself; in him are found the most insistent arguments for the work in Nature-Study. Such knowledge lends assurance and confidence. That such instruction should be given is then most evident.

"But" you say, "how could this sort of study and instruction be included in a course already overcrowded?" Easily, it seems. The courses in psychology and pedagogy, quite generally offered and required in normal schools, training schools, and institutes, might be modified along the lines of the child study idea, and with profit. The formal psychology deals with the adult mind, and with abstractions but feebly related to the interpretation and understanding of the instincts and interests and manner of development of the child, and consequently, are of relatively small value in determining methods based upon instinctive interests. We must turn to the study of the child himself, so that we shall no longer attempt to interpret him in the light of adult experiences and interests. This study of the child furnishes the materials for our theory, or the why of Nature-Study, for it has to do with the biological and psychological significance of Nature contact in the life and development of the child. This surely should be a part of the training of the teacher.

We may now turn to the other element of the problem, namely, the need for a first-hand knowledge of Nature. Not that kind of information secured through books, though they of course must

ever be at hand, but, in part at least, from a contemplation of Nature herself. That this contact should be extensive as well as intensive is, of course, desirable, in order that the fragments chosen for the lessons of the child, or the bits he finds and brings to his teacher, may be seen in good perspective. Facts are of importance only as related to others, and relationships must be known. So large is the field from which the experiences of the child call for explanation, that a broad foundation in scientific lore must be had to know the relative importance of divers facts, and how they are related to a useful principle. The study of a pebble is important in its relation to an understanding of how earth-making and earth-changing processes are going on; the parts and function of the elements of the flower are important as they illustrate a great principle in Nature, and contribute to an understanding of sex-life everywhere; the life story of the butterfly is significant in relation to similar phenomena in other forms, even to great changes in the life of man. Over emphasis upon unimportant details, or failure to relate them to a useful principle are two of the commonest elements in poor teaching. This power of discrimination can be expected only as an outcrop from an underlying stratum of extensive experience and training, and until such be supplied no large results may be expected. And even if they be had, there is still another avenue along which we may make progress, and that is, I feel sure, to narrow the problems with which we deal to a few, well worth while, and entirely within the comprehension of the child. Too frequently are the problems suggested and outlined such as only mature minds may comprehend. Knowledge of the mental life of the child must determine the nature of the problems with which he is seriously to deal. Limitation of problems to child comprehension is certainly necessary, and that there is need for such action is evident upon examination of Nature-Study courses outlined in many catalogs and courses of study. All of which suggests the need for better perspective and more efficient training.

Even with such specialized training, success is not assured. In teaching, as in other professions, particular attributes are essential, and for the kind of teaching we are considering, that of enthusiasm or sincere interest, is I think, most fundamental. Interest, like some diseases, is contagious. A teacher, full and overflowing with enthusiasm in pursuit of Nature's secrets, will invariably impart that enthusiasm to others. It tempers and determines

mental attitudes, encourages sincerity and open-mindedness, and supplies the best conditions for healthy growth. Childrens' interests are spontaneous and overflowing once they be set in motion; but like the safety match, they must rub against the right combination of mental materials before responding with fire, and those materials are furnished by the mental life of the teacher. That this is only a partial representation of the truth is admitted since the contact may take place through the medium of a book. But it is spirit contacting with spirit. So I would rate this attribute of genuine interest and enthusiasm very high. It is that which inspires or breathes the breath of mental life into others. And how is it to be had, you ask? Verily the answer is plain; from another spirit afire with enthusiasm and genuine interest. Such are they who are the great teachers, and whose influence is never lost. Genuine interest is essential.

There is yet another element of training which must not be overlooked, since its importance is paramount. I refer to the mental habit of seeking knowledge first-hand, without prejudice nor regard to the opinions of others. So thoroughly accustomed and habituated do pupils become to the use of books as a source of ideas that it is difficult indeed, once they approach the age of maturity, to induce them to rely, even in a small measure, upon their own senses as a source of knowledge. And, after all, nothing other may rightfully be expected when so large a part, if not the whole, of the efforts of the schoolroom consist in getting, or preparing the pupil, to get his ideas from books. That books must ever be at hand is admitted, but their excessive use is obviously a source of weakness. Independence in observation, in judgment, and in action can only be weakened by prolonged subservience to authority. Hence a training to see, to observe critically, to render judgments, to think independently, is of high importance, and the teacher must possess these mental capacities before he may hope to excite them in his pupils. All of which means, obviously, that the preparation of the teacher must include a liberal amount of objective study, vigorous if need be, to shift somewhat the gears upon which the mental machinery is accustomed to operate. That such training should include laboratory and field work is plain. With such training in abundance, it is unlikely that the teacher shall discourse upon the characteristics of a maple tree when one is growing outside the door of the school or try, from a picture to teach the children the

attributes of a bluebird when many times daily one is singing from the fence posts along the side of the school yard. "Study Nature; not books" was the motto over the door of the laboratory wherein the spirit of the great Agassiz held sway, and the injunction is the very essence of the Nature-Study idea.

Following directly after the elements of training thus far referred to, is another which grows out of them as a matter of necessity. I have in mind the attainment of a skill in the organization of materials on a teaching basis. Success or failure lies here. To work over a unit of thought to discover the logical relationships of its parts, to discern the outstanding elements worthy of emphasis, to understand the sequence in which they may be comprehended, to be able to arrange them in the order necessary to the comprehension of the principle toward which they point, is, I maintain, a large and decisive factor in successful teaching. It is clear then, that practice in the manipulation of material should be provided. Units of teaching must be gone over to discover the parts and their arrangement upon a teaching basis. That this can be done only in the light of extensive knowledge is obvious; that it is essential is equally true, and emphasis upon it should effect a distinct reduction in the haphazard and shapeless teaching so commonly found. The Nature-Study lessons, to be effective, must be well organized.

This brings us then, to the last point I wish to make, how be it, others might well be set up. But this one is, I feel, so frequently overlooked as important, that special emphasis is here laid upon it. I point now to the opportunity of seeing good teaching done. By this I mean as well that the teacher should be skillfully taught as that he may see good teachers in action. Unconsciously pupils take on the mental attitudes of their teachers, and unwittingly ape their mannerisms and follow their methods. More and more am I convinced of the powers of imitation in producing good teachers, and less and less regard do I have for the efficacy of formal instruction in psychology or pedagogy as determining factors. Particularly is this true of young teachers. Seldom indeed, does the average teacher make conscious application of a psychological or pedagogical principle to the problems of his teaching, but continually the modes of thought, the manner of approach and the general method of action characteristic of his teachers are breaking out in his own. Observation of good teachers in action give mental pictures sure to influence toward similar ways, and, at the

same time, give assurance that they are right. Even then, must good teaching prevail in the training of those who are to teach, and we must recognize it as highly important.

We may, in the way of summary, briefly call attention to the points made. They have clustered about two centers: the one concerns the understanding of the nature of the physical and mental development of the child, and the other with those elements in training essential to his wise and forceful instruction. The former lends a firm and certain belief in the need, the adequacy, and the inspiration lying in the study of Nature and her ways. The latter attempts to show what are the mental attributes most essential in those who are to direct children in their study of Nature. And all of these ideas are directly and inextricably associated with the most fundamental element of the present Nature-Study problem—the adequate training of teachers.

A Migration of Beetles

By R. A. Sell

An army of striped cucumber beetles, so many that their number could not be estimated, eight miles wide and about one hundred miles long must seem formidable to a truck gardener.

About three weeks after the Galveston storm of 1915 great numbers of Striped Cucumber Beetles were seen in a migratory movement. This was especially interesting because these beetles do not usually collect in great numbers like grasshoppers and other insects. While they often become plentiful and are very destructive to cucumbers, pumpkins, squashes, etc., they do not, as a rule, travel any greater distances than is necessary to find their favorite food plants.

In this instance they came from the north and traveled in a general southward direction. They flew comparatively short distances and were content to rest on most any kind of a plant. Every time a beetle took to wing it flew towards the south. The line of beetles was eight miles wide and probably over one hundred miles long but after it had passed over, there were no stragglers left behind. Beetles that were marked at Houston and Ballaire by painting their wing-covers with a dash of red India ink were found three days later near Texas City Junction. At Livingston and Colmesneil, where there had been many beetles all summer, the

native beetles were very restless before the migrating hosts arrived and almost all of them joined the army and left the cucumber patches. The migration lasted about ten days then the beetles began to scatter over the country and settle down.

The Striped Cucumber Beetle (Diabrotica Vittata) belongs to the same family as the Western Flower Beetle and the Corn-root worm or Twelve-spot and is sometimes characterized as a "slim green lady-bug with black stripes on its wings" but it is not a "lady-bug." The "lady-bug" or Ladybird is a predacious beetle that feeds on other insects, mostly plant-lice, and is considered very

A B C

Striped Cucumber Beetle (*Diabrotica Vittata*)
A. Female covered with mites.
B. Female. C. Male.

beneficial while the Diabroticas eat plant food and are very destructive to crops.

Some of the female beetles carried a few Gamæsid mites (Uropoda sp Banks) on their wingcovers. These mites are mentioned in Circular number 34 State Entomologists Dept., St. Paul, Minn., as loading themselves upon the wings in such great numbers that the beetles are unable to fly. Aside from making the beetle carry an extra load it does not appear that the mites are harmful to the beetles—they are simply getting free transportation.

Nature-Study and the Common Forms of Animal Life
III

Dr. R. W. Shufeldt

(Reproductions of photographs from life by the author)

Having touched briefly upon the life histories of our Mourning Dove, the Spotted Salamander, and the Common Toad in No. II of the present series (Oct., 1915, p. 309), it is my intention to introduce, in this instalment, a number of other forms, any one of which it is important for the young naturalist to know something about, and which, as a matter of fact, in every instance offer a whole lot in the lives they lead that is full of interest to the true student of Nature who aims to become as well acquainted as possible with the animals of this country.

Not long ago, I asked a friend if he had any idea as to the number of squirrels we had in our United States fauna—he, at the time, was entertaining several bystanders with accounts of his many hunting adventures. He replied very promptly that he had killed every kind of squirrel in America, and had hunted them from the woods of Maine to the lower southwest corner of California. Without disputing this point, I quietly awaited a reply to my direct question. Observing this in my manner, he remarked that there were at least a dozen different species of squirrels in this country, and he would not be surprised if there were as many as fifteen, as he had heard that there were a few very like some of those he had killed, though not quite the same. Having committed himself to this extent, and noticing that I still awaited his list, he gave a knowing wink to those to whom he had been retailing his adventures, saying with marked assuredness: "Well, we have the red squirrel, the gray squirrel, the fox squirrel, the chipmunk, the flying squirrel, the black squirrel, the tufted squirrel (Abert's?), and, and — —." And there he stopped, very much to the amusement of his group of listeners. "Well, friend," said I, "you have hardly named half of the number you said existed in this country—specimens of all of which you had killed. To tell you the truth, if we count in all the different kinds of chipmunks, flying squirrels, and, of course, the true squirrels, we have in the United States alone—that is, apart from Mexico and Canada, a list of species and subspecies of these animals running up to within two or three of *one hundred*. Many of them have no vernacular or common names; and the majority of them are known only to the professional

mammalogist." This statement silenced the hunter who, giving me a stare as though he considered me the most monumental prevaricator he had ever come across, silently walked away.

Now, what we please to call the moral of this story may be viewed from several standpoints. In the first place, it must be remembered that not one person in a good many thousand in this country has any idea as to the number of animals represented in

FIG. 9—Red Squirrel

any particular group—be it fish, birds, reptiles, or mammals; again, unless one be so informed, it is not at all becoming, under any circumstances, to boast about one's knowledge of such matters. Then, too, unless the young nature student intends to become a professional zoölogist, it is not necessary to be familiar with the names and characters of all the forms in any group of animals in the country in which he lives, much less of those of all other countries. He or she is doing very well if acquainted with all the creatures inhabiting the district in which one lives, or

where one's home is. There may be upwards of a thousand different species and subspecies of squirrels in the world's fauna; but the young student, living in Maine, Florida, Utah, or Oregon—there are different kinds of squirrels in all of these States—will be doing very well if perfectly familiar with the general characters of the family, with the special ones, and with the

FIG. 10—California Quail

names of the animals of that group in his or her own particular neighborhood.

We may take our much-beloved little red squirrel of the eastern temperate region of the country as an example (Fig. 9). It belongs among the true squirrels; that is, it is a rodent of the family *Sciuridæ*, and of the genus *Sciurus*. It is well to know that, associated in the same family, in the United States, we have many more true squirrels like it, as well as a perfect host of ground squirrels, more or less nearly allied to our common chipmunk.

The specimen shown in Fig. 9 has a number of common names, as the Red Squirrel, the Chickaree, and so on; but to scientists it is the *Sciurus hudsonicus loquax*, that is, it is the subspecies *loquax* of the type species *S. h. hudsonicus*. The one here shown was captured in northern Virginia, and brought to me a few hours afterwards; I had the time of my life getting the picture of him which illustrates this article. At first he was as cross as a crab, and as wild as you make them. But, shutting myself up with him in a small room, and hanging a few yards of an old grape-vine across it, I started in on the task in a manner that was sure to lead to success *in due time*. After a while I convinced that wild little vixen of the woods that it was *not* my intention to murder him in cold blood, and in a few hours he became more gentle, then more and more fearless, as I would catch him with my gloved hands, *gently* letting him go again, after he had nearly exhausted himself trying to bite through my thick gloves. Finally, he became very thirsty and hungry, so I coaxed him out on the swinging grape-vine with the promise of a nice, fat hickory nut and a sip of cool water. Eventually, this was too much for him; he surrendered, and Figure 9 was my reward. And his? The woods of his native haunts again, with all that they mean to a little red squirrel.

Not long afterwards, in that very same little room, my patience was tested to the limit during my attempts to obtain some equally good pictures of two or three—three I believe there were—varieties or species of the beautiful quails that are found in California and other western States. One of the most attractive of these is reproduced in Fig. 10 of this instalment of our nature series—a graceful, gentle little partridge of great beauty of plumage. Its peculiar independent little crest or plume curls forwards as shown, and it is composed of several glossy black feathers. White stripes occur on the head as shown; the back is ashy, glossed with olive-brown, and the breast is of a fine slaty-blue. This is the "quail" of California, and known as the California Quail, its scientific name being *Lophortyx c. californica*. Local sportsmen and others call it the Valley Quail in contradistinction to the Mountain Quail, which is an even more handsome species, found in some parts of the same region in the mountainous districts. These birds, be it said to the shame of California, are slowly but surely being exterminated by the improved small arms now in use by the modern sportsmen. Thousands of people ask this question every day: "What is

becoming of so many of our beautiful game birds?" never thinking for a moment that they are being wiped off the face of the earth by man himself! If we could take every man out of California and keep them all out for half a century, the country would again swarm with her beautiful quails; the problem would solve itself, and the great question be truly answered. Every boy in America should remember this and ever keep the fact before him; not only for California's beautiful quails, but for all the rest of our game birds and mammals.

FIG. 11. Common Sunfish

Speaking of the number of species and subspecies that may occur in any assemblage of American forms in Nature, there is a no more numerous one in the vertebrate or back-boned series than fishes. We have simply hundreds of different kinds of fish in our ichthyfaunæ; for not only is there an enormous array of them in oceanic families and other groups, but we likewise have all of our inland varieties, as those found in our rivers, lakes, and other bodies of fresh water, in different parts of the country, from Alaska to the Mexican boundary line. Indeed, naturalists—perhaps I had better say ichthyologists—have lived and died who devoted their entire lives to this branch of biological science, and then never got

past a study of a few groups of our fishes—sometimes only one or two—having been quite satisfied with their life's work.

Of all this great and diversified array of beautiful forms in nature, there is perhaps no single species that interests the boy naturalist more than the Common Sunfish, which has several other vernacular names, as the Bream, the Tobacco-box, the Pumpkin Seed, the Sunny, and so on. Its scientific name is one not hard to remember, and it dates back to the classification of fishes by the great naturalist, Linnæus, who considered it to be a perch, and so called it *Perca gibbosa*—*gibbosa* referring to the full moon and to the round form

FIG. 12—Sunfish Swimming

of the fish (Fig. 11). It is now known as *Eupomotis gibbosus*, the generic name referring to its prominent "opercle" or ear. In other words, it calls attention to its prominent "ear-mark" or black spot on the operculum, or the bone that *looks* like an ear; though you must remember it has nothing to do with an organ of hearing in this fish or in any other species.

The Sunfish is as elegant a little fresh water form as one could wish—compact and perfect in structure, and brilliant in the matter of beautiful coloration. It is found in clear brooks and ponds all over the country, from the Mississippi Valley to the Atlantic coast, to the Gulf of Mexico. It is *the* fish that interests the boy angler, and I am quite sure I caught my share of them when I was a boy;

indeed, were the truth known, I expect I have played "hooky" a number of times that I might go fishing for Sunfish in the old "Mill Pond" at Stamford, Connecticut. The pond is still there, and I dare say a few Sunfish are yet to be found in it.

I give a good illustration of one of these beauties in Figure 11 of this chapter, made from life. It was taken in a special aquarium which I had had constructed for the very purpose of getting photographs of fishes from life. Several years ago, I took a large number of such photographs at the Aquaria of the United States Bureau of Fisheries at Washington, and among them were some very interesting ones of Sunfish. One of these is here reproduced in Figure 12, which is quite satisfactory when one comes to realize that there are nearly twenty fishes in it—all in motion. At another time I will show you some more of my photographs of living fishes in aquaria.

An Adventure

LOUISE RAVENS

It was a Saturday in mid-October—perhaps the 18th or thereabouts. The day was mild, sunny at times, and called insistently to the out-door people to be off for the woods. For some days I had been noticing groups of Wilson thrushes, large companies of kinglets, and an occasional towhee, in the trees and among the shrubbery of the gardens, showing that the fall migration was at its height and that our transients had arrived from the north.

With the hope of seeing some rarer bird and, perhaps scenting an adventure, I took with me my opera glasses and turned my face northward toward some open spaces which had long invited me to come and make their more intimate acquaintance.

As I walked along the country road, I was greeted on every hand by the latest of late wild flowers—a few purple asters, numerous white and blue ones and, here and there a still-bright spray of golden rod. The trees were at their autumn best, the golden elm and the wine-red oak adding color to the landscape But what interested me most was the occasional whirr of a swift-winged bird, and I soon found a spot on the slope of a little gully which seemed sheltered and cosy and seated myself on the ground to await developments.

I had not long to wait for almost immediately I saw, on the dry floor of the ravine, a Wilson thrush busily scratching away, seeking tid-bits—evidently with good results, for he soon flew to a twig but a few feet from the opposite bank from where I was sitting, and settled himself for a "nap of full content."

He dreamily closed his eyes, at intervals blinking good-naturedly at the sun. It was a good world to be in—a lovely, lazy, loafy world. He had been sitting thus for some minutes when I was surprised to see him suddenly open his mouth—for all the world like a young robin asking for food—and regurgitate what seemed to be the stone of a wild cherry. I had not known before that regurgitation is one of the digestive tricks of the Wilson thrush. Having disposed of the useless morsel, he resumed his dreaming. All this I observed through my opera glasses, which I held leveled at his immediate locality.

All at once I became aware of a movement in the grass about six feet back of my little protegé, and on looking more closely, I found that an immense Maltese cat was creeping along in the exact direction of the birdling, who was quite unconscious of the foe that lurked behind him. Before I needed to decide on a course of action to protect the little thing, to my astonishment I beheld two wild, terror-stricken eyes gazing into mine through the opera glasses. The cat had discovered the awful creature with the awful thing in its face, and was stunned with fright. For an instant she continued to gaze at me, and then she began to back—carefully, cautiously, with her eyes still focused on the object of terror which I held pressed to mine. She retreated a few steps, turned, gave me one more look, and fled for safety. It was clearly a case of "safety first."

The little thrush, who had been unaware of the whole procedure, still sat blinking and dreaming. Once more I saw him regurgitate, and again, and yet again. Then he flew away for more worlds to conquer—perhaps round, round worlds in the shape of cherry ends. The opera glasses had saved the day.

A Few Fish Freaks

G. T. K. Norton

Comparatively little is known or taught of fish. Text books do not deal very completely with them unless a special course is taken and, as we can not breathe water, it is rather difficult to study them in their natural surroundings. We have all visited aquariums and fish markets so coming to know a few specimens upon sight, nevertheless the under water family has many members worthy of our

Courtesy N. Y. Zoological Society

Fig. 1—Yellow Fin Grouper. N. Y. Aquarium

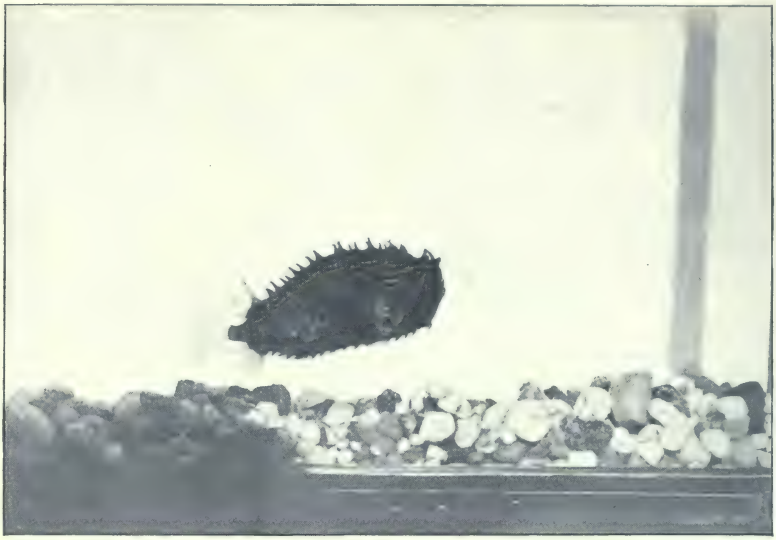
notice which not only furnish amusement but teach their little lesson.

The Tilefish, a new deep-sea food fish which the Government is pushing as palatable and inexpensive, has a most interesting history; the discovery, the almost complete extermination, and the rapid reestablishment of this large, handsome and valuable species, all within fifteen years, is one of the wonderful feats of marine biology.

The discovery was made in May, 1879, by a fisherman while fishing near the hundred-fathom curve, south of Nantucket He sent some of the "strange and handsomely colored fish" to the

United States Fish Commission who found it to be Lopholatilus chamæleonticeps (crested tilus with a head like a chameleon).

The Tilefish was at once appreciated and efforts made to locate the fishing grounds but before much was done the fish was practically exterminated by a mysterious coastal slope disturbance. More than a billion and a half tile were found floating dead upon the surface of the water. The Tilefish is a bottom dweller accus-



Courtesy N. Y. Zoological Society

FIG. 2. Spiny Boxfish in N. Y. Aquarium

tomed to warm water: it finds a congenial temperature where the Gulf Stream touches the sea bottom.

There is evidence that about the time of the decimation of the Tilefish the Gulf Stream was receding from the coast: as it moved off-shore its warmth no longer touched the bottom so the Tilefish was left in chilly waters. A few years later, in 1892, the Gulf Stream once more bathed the New England coast and with its return came the Tilefish. Whether the straying of the Gulf Stream was, or was not responsible for this "tragedy of the sea," the return of the current to its old course was coincident with the return of the fish, and now it is as numerous as ever.

Another interesting arm of the fish family is composed of the Groupers. Yellow-fin Grouper is the tribe leader and is fairly

bubbling over with surprises. Nature has given to the Grouper, as she has to many of her charges, the secret of adaptive coloration, that is, the ability to change color as circumstance dictates. When in captivity he changes color for no particular reason except possibly

Courtesy N. Y. Zoological Society

FIG. 3. Ladder Fish. N. Y. Aquarium

habit and that he may wish to be obliging; but when in the open sea, the Grouper habitat is deep in the waters about the West Indies, Florida and Bermuda, there are the best of reasons for the change of garb. The chief causes of the color change are for the purpose of concealment from natural enemies, the capture of food, and for signaling other fish of his kind upon the approach of danger. The change of color is also used to mimic the color and actions of other fish, and, most important of all, to win the love of "Mrs. Fish."

The color cells which enable the fish to make these quick changes are in the inner skin and are under instant control. From a beautiful blue with yellow tipped fins and large dark spots the fish will fade to a cream white in a few seconds; any degree of color between these two extremes may be attained. The Grouper is also able to poison its meat though it is considered a valuable food fish and thousands of pounds are marketed yearly. They reach a length of three feet and are among the most beautiful of southern fish. The faculty of adaptive coloration occurs among many kinds of animals, being most noticeable among the insects, but the Grouper has no competitor under water.

The Spiny Boxfish is unusual but not beautiful. The whole top of the nearly flat back is covered with small horns or spikes of varying lengths; a square body, repulsive face and dull coloring do not tend to give him attractiveness. The habitat is all along the Atlantic seaboard.

Occasionally the Boxfish tires of swimming and inflates its body with air and floats upon the surface. They are of no food value and seldom grow more than a few inches long.

The Ladder fish, a native of the Amazon river, is beautifully delicate with feelers and filmy fins; the body is somewhat like the sunfish though much more brilliant. Few aquariums have them, they are difficult to keep. The two specimens in the New York aquarium are watched carefully and the water kept at a fixed temperature. In the tank there is a piece of large meshed wire netting, to this the fish cling going slowly up and down, half swimming and half climbing.

List of Instructors in Nature-Study

ELLIOT R. DOWNING

There follows a list of instructors in Nature-Study, Elementary Science and Elementary Agriculture in the Normal Schools and Colleges of Education in so far as these institutions have such departments. Circular letters sent out from the Editor, with stamped and self-addressed envelopes for reply asked for the information stating that if no reply were received it would be taken for granted that no such department was maintained in the school. The mailing list was that of the Government Department of Education's Directory. This letter was followed up by the letter given below, also provided with stamped envelopes for reply. The list should be reasonably complete.

Chicago, Ill., Dec. 1, 1915.

DEAR SIR:

There will be published in the NATURE-STUDY REVIEW, in an early number, a list of the instructors in Nature-Study, Elementary Science and Elementary Agriculture in the Normal Schools and Colleges of Education in this country. We have the names of your instructors as given below. Will you please correct them and make additions? If no reply is received by December 20, 1915, it will be taken for granted the names given are correct and that there are no additions.

Thanking you in advance for your attention to this matter, I am

Yours respectfully,

ELLIOT R. DOWNING.

Location	Institution	Teachers
ALABAMA		
Daphne	Daphne State Normal School.	H. Leon Kersh, Walter B. Spur, H. H. Homes.
Florence.	State Normal.	
Jacksonville.	State Normal.	
Livingston.	State Normal.	
Montgomery.	State Colored Normal School.	
Moundville.	State Normal School.	
Normal.	Agricultural and Mechanical College for Negroes.	Prof. R. H. Hampton, H. C. Hopkins.
Troy.	State Normal School.	F. J. Cowart, Celestia Darby, Myra Segars, Mrs. W. R. Lancaster, Loraine Hammel, Catherine Gardner.
Tuskegee.	Tuskegee Normal and Industrial Institute.	G. W. Carver, J. T. Wiliamson, E. M. Parish.
ARIZONA.		
Flagstaff.	Northern Arizona Normal School.	Willis Berg, Leslie N. Gooding.
Tempe.	Tempe Normal School.	R.B. Beckwith, J. D. Payne, J. B. Griffing.

ARKANSAS.		
Conway.	Arkansas State Normal School.	J. T. Buchholz, E. E. Cordrey, K. L. Holloway.
Pine Bluff.	Branch Normal College (Colored).	
Pea Ridge.	Pea Ridge Masonic College.	
CALIFORNIA.		
Arcata.	Humbolt State Normal School.	L. R. Davis, W. A. Beer.
Berkley.	Miss Barnard's Kindergarten Training Sch.	Flora Randolph.
Chico.	State Normal School.	C. A. Stebbins.
Fresno.	State Normal School.	C. L. Flint, S. W. Cunningham.
Los Angeles.	State Normal School.	Dr. Loye H. Miller, A. A. Hummel, Florence Hallam, Sarah Atsatt, Faith E. Swift, F. E. Older.
San Francisco.	State Normal School.	W. T. Skilling, James G. Wilkinson, Vinnie B. Clark, Carleton W. Washburn.
San Jose.	State Normal School.	Etta Kinney, D. R. Wood.
Santa Barbara.		
CONNECTICUT.		
Bridgeport.	Bridgeport City Normal School.	
Danbury.	State Normal Tr. Sch.	Lothrop Higgins.
New Britian.	State Normal Tr. Sch.	
New Haven.	State Normal Tr. Sch.	Arthur B. Morril, Ella M. Broderick, Alice L. Wright.
Willimantic.	State Normal Tr. Sch.	F. W. Stæbner.
DIST. OF COLUMBIA		
Washington.	J. Ormond Wilson Normal School.	Susan B. Sipe.
Washington.	Washington Normal School (Colored).	
FLORIDA.		
Madison.	Florida Nor. Institute.	
GEORGIA.		
Athens.	State Normal School.	Frederick A. Merrill, D. L. Farnest, E. S. Sell, Chloe Allen.
Milledgeville.	Ga. Normal & Industrial College.	Artie Bell Carter, Frances L. Lowe, Marjorie Lambert, Edwin H. Scott.
Valdosa.	South Georgia Normal School.	Alice L. Prichard.
IDAHO.		
Albion.	State Normal School.	C. E. Bacock, Caroline Ruth Jackson.
Lewiston.	State Normal School.	Oliver M. Osborne, Marguerite Tyler.
ILLINOIS.		
Carbondale.	Southern Illinois State Normal University.	J. P. Gilbert.
Charleston.	Eastern Illinois State Normal School.	T. L. Hankinson.
Chicago.	Chicago Kindergarten Institute.	Dr. H. S. Pepoon.

Chicago.	School of Education, Univ. of Chicago.	O. W. Caldwell, E. R. Downing, Homer Sampson, C. F. Phipps.
Chicago.	Chicago Teacher's Col.	John W. Shepherd, Grant Smith, John H. Whitten, Mary Blount
De Kalb.	Northern Illinois State Normal School.	R. E. Wager, C. W. Whitten, Chas. Keltner, Ruth Marshall.
Macomb.	Western Illinois State Normal School.	C. W. Finley, C. W. Henderson, F. H. Currena.
Normal.	Illinois State Normal University.	H. W. Waggoner, J. L. Pricer, Alice J. Patterson.
Oak Park.	Concordia Teacher's College.	Prof. G. Eifrig, Prof. All. Miller.
INDIANA.		
Angola.	Tri State Normal.	W. A. Fox, Robert D. Gardner.
Danville.	Central Normal Col.	J. B. Thomas, C. A. Hargrave.è
Fort Wayne.	Normal Training Sch.	Norma Erf.
Indianapolis.	Indianapolis Nor. Sch.	Rousseau McClellan.
Indianapolis.	Teacher's College of Indianapolis.	Eliz. Downhour, Bertha Ellis.
Marion.	Marion Normal Institute.	G. W. Foster, C. C. Thomas, A. Jones.
Terre Haute.	Indiana State Normal School.	W. S. Cox, Dr. Roscoe R. Hyde, Walter Woodrow, L. M. Bruce, Edith Bader.
IOWA.		
Cedar Falls.	Iowa State Normal Sch	M. F. Arey.
Shenandoah.	Western Normal Sch.	U. G. Desmond.
KANSAS.		
Emporia.	State Normal School.	L. C. Wooster, Frank U. G. Agre lius.
Hays.	Fort Hays Kansas Nor mal School.	L. D. Woster, J. S. Bird, W. G. Speer, Rex W. Cox.
Pittsburg.	State Manual Training School.	
KENTUCKY.		
Bowling Green.	Western State Normal.	Dr. Fred Mutchler, Florence Ragland.
Frankfort.è	State Normal & Industrial Institute.	
Lexington.	Chandler Normal Sch.	F. J. Werking.
Richmond.	EasternKentuckyState Normal School.	
LOUISIANA.		
Natchitoches.	Louisiana State Normal School.	J. W. Bateman, George Williamson, Norma Overbey.
New Orleans.	New Orleans Normal School.	M. F. Reames, M. E. Davis.
MAINE.		
Castine.	Eastern State Normal School.	
Farmington.	Farmington State Normal School.	Katherine E. Abbott.
Fort Kent.	Madawaska Training School.	
Gorham.	Western State Normal School.	Ethel Worldridge, Jesse L. Keene and Viola White.
Lewiston.	Lewiston Nor. Training School.	

Machias.	Washington State Normal School.	Earl D. Merrill, Cleora Del Coster.
Presque Isle.	Aroostook State Normal School.	W. D. Hall.
Springfield.	Eastern Maine Inst.	P. D. McLaughlin.
MARYLAND.		
Baltimore.	Teacher's Training Sch	
Baltimore.	Colored Training Sch.	Anna Williamson.
Baltimore.	Maryland State Normal School.	Earnest E. Race, Camilla J. Henkle.
Bowie.	Maryland State Normal School.	
Frostburg	Maryland State Normal and Industrial School.	
MASSACHUSETTS.		
Bridgewater.	State Normal School.	Florence I. Davis.
Boston.	Normal School.	Gertrude Weeks.
Fall River.	Normal Training Sch.	
Fitchburg.	State Normal School.	W. D. Meier, L. L. Workman.
Framingham.	State Normal School.	Emma Hunt.
Hyannis.	State Normal School.	Minerva A. Laing, Julia Anne Hayner.
Lowell.	State Normal School.	C. M. Weed.
Salem.	State Normal School.	Gertrude B. Goldsmith, WalterG. Whitman.
Westfield.	State Normal School.	Chas. B. Wilson.
Worchester.	State Normal School.	Arabella H. Tucker, Lee Russel.
MICHIGAN.		
Detroit.	Wales Martindale Normal Training School.	
Grand Rapids.	Grand Rapids Kindergarten Training Sch.	Grace T. Ellis.
Kalamazoo.	Western State Normal	L. H. Harvey, Wm. McCracken, E. D. Huntington, J. A. Petrei.
Marquette.	North'rn State Normal School.	T. C. Hebb, S. D. Magers.
Mount Pleasant.	Central Normal Sch.	MacK. Woldt, M. A. Cobb, M.K. Noldt.
Ypsilanti.	Michigan State Normal School.	W. H. Sherzer, B. G. Smith, Jessie Phelps, Cora D. Reeves, Mary A. Goddard, Meta Daniel.
Pontiac.	Oakland County Nor.	Kate H. Brown.
Owosso.	ShiawasseeCounty Nor	Elizabeth Burns.
Standish.	Arenac County Train-School.	Emma E. Arnold.
MINNESOTA.		
Duluth.	State Normal School.	C. H. Frazee.
Mankato.	State Normal School.	Gilbert H.Traffon, A.D.Whedon.
Madison.	Luthern Normal Sch.	A. Hegre.
Moorhead.	State Normal School.	C. A. Ballard, G. B. Kendall, Ira W. Singsby.
New Ulm.	Dr. Martin Luther Col.	A. F. Reim.
St. Cloud.	State Normal School.	G. C. Hubbard, I. T. Johnsrud.
St. Paul.	St. Paul Normal Sch.	Anders Orbeck.
Winona.	State Normal School.	L. C. Sutherland, J. M. Holzinger.
MISSISSIPPI.		
Hattiesburg.	Mississippi Nor. Col.	J. R. Slay, A. B. Dille, T. F. Jackson, Jesse Mae Lomax.

Shelby.	Industrial Agricultural College for Negroes.	J. M. Williamson, L. B. Russel, L. A. Shipp, H. B. Ellis.
MISSOURI.		
Cape Girardeau.	State Normal School.	H. L. Roberts.
Jefferson City.	Lincoln Inst. (Colored)	
Kansas City.	Frœbel Kindergarten Training School.	C. R. Jaccard, Genevieve Kirksbride, Clarice Evans.
Kirksville.	State Normal School.	
Maryville.	State Normal School.	R. A. Kinnaird.
St. Louis.	Harris Teacher's Col.	J. A. Drushell.
Springfield.	State Normal School.	D. S. Kizer, Blanche Skinner.
Warrensburg.	State Normal School.	B. M. Stigall, R. A. Ganze.
MONTANA.		
Dillon.	Montana State Nor.	Robert Clark, Walter Scott.
NEBRASKA.		
Chadron.	State Normal School.	C. A. Berge.
Kearney.	State Normal School.	Carrie E. Ludden, O. H. Sutton, John Ludden.
Peru.	State Normal School.	Clifford B. Hendirck, F. C. Jean.
Wayne.	State Normal School.	H. H. Hickman.
Fremont.	Fremont Normal Sch.	Mrs. L. Stump, Eva Mixer, A. Saftley, N. W. Gaines.
NEW MEXICO.		
Las Vegas.	New Mexico Nor. Univ	C. F. Lewis, H. V. Mathew.
Silver City.	New Mexico Normal School.	J. F. Brownlee, Leo A. Douglass.
NEW YORK.		
Albany.	Teacher's Train. Sch.	Carolyne Lawrence.
Brockport.	State Normal and Tr. School.	Nina M. Gage, Bertha M. Kelsey
Brooklyn.	Training School for Teachers.	Chester Mathewson, Ella Merrill, Maud Staber, Harriet Luddington, Evelyn H. Northrup, Jacob Clark.
Buffalo.	State Normal School.	Elizabeth L. Bishop, O. L. Pease.
Cohoes.	Cohoes Training Sch.	
Cortland.	State Normal and Tr. School.	Walter Myron, William P. Brodie, Lee W. Crittendon.
Fredonia.	State Normal and Tr. School.	Franklin N. Jewett, Mrs. Carrie Record, Edith Graves.
Geneseo.	Geneseo State Normal School.	G. A. Bailey.
Jamaica.	Training School for Teachers.	
New Paltz.	State Normal School.	Adeline Thurseon.
New York.	N. Y. Training School Teachers.	Anna M. Clark, Esther E. Prichett Grace G. Lyman, Irwin W. Driehaus.
New York.	Teacher's College, Sch. of Education, Columbia University.	M. A. Bigelow, Jean Broadhurst.
Oneonta.	State Normal School.	Ada K. Smith.
Oswego.	Oswego Normal and Training School.	Chester H. Tether.
Plattsburg.	State Normal School.	Geo. H. Hudson.
Potsdam.	State Normal and Tr. School.	J. F. Hummer.
Schenectady.	Teacher's Training Sch.	Mary Gorham.

Syracuse.	Syracuse Training Sch. for Teachers.	Myra K. Chandler.
Watertown.	Watertown Tr. Sch.	
Yonkers.	Yonker's Train. Sch.	Albert W. Mason.
NORTH CAROLINA.		
Asheville.	Normal and Collegiate Institute.	Grace H. Hamilton.
Charlotte.	Rowan Normal and Industrial Institute.	
Cullowhee.	Cullowhee Normal and Industrial School.	Evelyn Royall, F. H. Brown.
Elizabeth.	State Colored Nor. Sch.	
Elizabeth City.	Normal Schoolof North Carolina.	H. E. Lee.
NEW HAMPSHIRE.		
Keene.	State Normal School.	W. E. Mason, Josephine Strange.
Plymouth.	State Normal School.	Dr. Herbert H. Lamson.
NEW JERSEY.		
Brockport.	State Normal Training School.	C. O. Beaman.
Elizabeth.	Normal Training Sch.	Mary Mathews.
Jersey City.	Jersey City Teacher's Training College.	Victoria K. Ralph.
Montclair.	New Jersey State Normal School.	C. H. Robinson, Alice M. Dike.
Newark.	New Jersey State Normal School.	Daniel R. Hodgdon, L. A. Vinton
Patterson.	Patterson Normal Tr. School.	
NEW MEXICO.		
El Rito.	Spanish American Normal School.	Berenice K. Zingg.
Fayetteville.	State Colored Normal School.	
Franklinton.	Albion Acad. (Colored)	Ora M. Pettiford, Hester A. Robertson, A. R. Phillips.
Greenboro.	State Normal and Industrial College.	E. W. Grudger, Mary Robinson, E. E. Balcombe.
Greenville.	East Carolina Training School.	H. E. Austin, Marjorie M. Hesman.
Pembroke.	Indian Normal College	
Raleigh.	St. Augustine's School.	Robert B. Jefferson, John W. Holmes.
Winston.	Slater Industrial and State Normal School	
NORTH DAKOTA.		
Ellendale.	North Dakota State Normal & Industrial School.	T. C. Hathway.
Mayville.	State Normal School.	C. E. Tharmaldsen.
Minot.	State Normal School.	Chas. W. Hammond.
Valley City.	State Normal School.	Vida Austin, J. H. Seymour, Jas. C. McNeal.
OHIO.		
Athens.	Ohio State Nor. Sch.	Dr. W. A. Matheny.
Akron.	Perkins Normal Sch.	Mary Pottenger.
Bowling Greeen.	State Normal College.	E. L. Moseley, Wm. P. Hott, G. W. Beattie.

Cleveland.	Cleveland Normal Tr. School.	Jane M. Daren, F. B. Gilbum, W. S. Coy, Geo. Leathy, J.C. Hambleton.
Columbus.	Columbus Normal Sch.	
Dayton.	Dayton Normal School	Benjamin Showalter.
Kent.	State Normal School.	L. S. Hopkins.
Oxford.	Miami University.	B. M. Davis, Victoria Carson, Francis Ragland.
Woodville.	Woodville Lutheran Normal School.	F. Assenheimer, C. Vogel.
OKLAHOMA.		
Ada.	East Central Normal School.	E. A. MacMillan.
Alva.	Northwestern State Normal School.	S. C. Peaceful, A. G. Vinson, M. C. Mann, T. C. Carter.
Durant.	Southeastern State Normal School.	
Edmond.	Central State Normal School.	Fred H. Ives, W. C. Jameson, J. C. Adamson.
Langston.	Colored Agriculture and Normal Univ.	E. M. Watson, H. S. Estelle, F. J. Hilburn, S. R. Youngblood.
Talequah.	Northeastern State Normal School.	W. A. Gardner.
Weatherford.	Southwestern State Normal School.	O. W. Whitenton.
OREGON.		
Monmouth.	State Normal School.	L. P. Gilmore.
PENNSYLVANIA.		
Bloomsburg.	State Normal School.	D. S. Hartline, Bess Hinckley.
California.	Southwestern State Normal School.	W. Wentzel.
Cheney.	Cheney Training Sch. (Colored).	L. P. O'Hara, D. A. Williston.
Clarion.	State Normal School.	John Reaveley.
East Stroudsburg	State Normal School.	I. E. Walter, L. S. Cassel, Elizabeth Kurtz.
Edinboro.	State Normal School.	W. J. Snyder, F. E. Baker, R. Staunciiffe.
Erie.	State Normal School.	
Harrisburg.	Teacher's Training Sch	
Indiana.	State Normal School.	Ralph L. Talbot, Elbert M. Jackson, C. M. McConnell.
Kutztown.	Keystone State Normal School.	
Lockhaven.	Lycoming County Tr. School.	D. A. Green.
Muncy.	Central NormalSchool.	
Millersville.	State Normal School.	Derle Hess.
Mansfield.	State Normal School.	Geo. B. Strait, Clifford Scouten.
Philadelphia.	Philadelphia Normal.	
Philadelphia.	Philadelphia School for Girls.	L. L. W. Wilson.
Philadelphia.	Philadelphia Schoool of Pedagogy.	Ezra E. Allen.
Shippensburg.	Cumberland Valley State Normal Sch.	Cora Flossie Macy, Blanch Corwin, Herbert Le Van.
Slippery Rock.	State Normal School.	I. N. Moore, C. C. Ruff, W. C. Cheeseman.

Westchester.	State Normal School.	Dr. Samuel C. Schmucker, A. D. Cromwell, Arthur D. Whedon, L. Frank Newman, Herbert Greenwalt.
Rhode Island.		W. G. Vinal, Marion Weston.
Providence.	R. I. State Normal Sch	Richard D. Tucker.
SOUTH CAROLINA.		
Charleston.	Avery NormalInstitute (Colored).	
Lancaster.	Lancaster Normal College (Colored).	
Greenwood.	Brewer Institute.	Joy Rifenburg, Mrs. W. S. Rice, C. H. Seckingher, H. W. Stevens.
Orangeburg.	Colored Normal, Industrial, Agricultural and Mechanical College of South Car.	Julia Mae Williams.
Rock Hill.	Winthrop Normal and Industrial College.	Chas. R. Weeks, R. N. Whitfield, Alpha Rasor, Alice V. Wilson.
SOUTH DAKOTA.		
Aberdeen.	Northern Normal and Industrial School.	Fred W. Smith.
Madison.	State Normal School.	L. G. Atherton.
Spearfish.	State Normal School.	Martha Williams.
Springfield.	State Normal School.	P. M. Gilmer, H. S. Stein.
Souix Falls.	Luthern Normal Sch.	O. M. Elvehjen.
TENNESSEE.		
Johnson City.	East Tenn. State Nor.	Della D. Smith.
Memphis.	West Tenn. State Nor.	Everett C. Smith, M. C. Sneed.
Memphis.	LeMoyne Normal Inst.	
Morristown.	Morristown Normal and Industrial Col.	J. H. Sheeley.
Murfreesboro.	Middle Tenn. State Normal School.	Harry P. Ogden.
Nashville.	State Agricultural and Industrial Normal for Negroes.	J. E. Anderson, J. L. White, A. C. Burnett, L. M. Ruffin.
TEXAS.		
Canyon City.	West Tex. State Nor.	L. R. Marquis, H. N. Giller.
Commerce.	East Tex. State Nor.	
Denton	North Texas State Nor. College.	C. L. Davis.
Huntsville.	Sam Houston State Normal Institute.	S. R. Warner, S. C. Wilson, Harriet Smith.
Prairie View.	Prairie View Normal and Industrial Col. (Colored).	
San Morcos.	Southwest Texas Nor. School.	C. S. Smith, P. T. Miller, C. W. Vernon, S. W. Stanfield, E. H. Harrison
UTAH.		
Salt Lake City.	Normal School.	J. H. Paul.
VERMONT.		
Castleton.	State Normal School.	Harry A. Farrar.
Johnson.	State Normal School.	Walter Helk Siple, Emma G. Elliot.

VIRGINIA.		
East Radford.	State Normal School for Women.	Mattie C. Denny, Flora Bryson.
Farmville.	State Normal School for Women.	Fannie W. Dunn, Thomas D. Eason.
Fredrickburg.	State Normal School.	Eula D. Atkinson.
Hampton.	Hampton Normal and Industrial Institute (Colored).	
Harrisonburg.	State Normal and Industrial for Women.	Margaret King, James C. Johnson.
Petersburg.	State Normal and Industrial Institute (Colored).	G. W. Owens.
Richmond.	Richmond Training School for Kindergartners.	Ruth Floyd Anderson, Lucy S. Coleman.
WASHINGTON.		
Bellingham.	State Normal School.	W. L. Moodie, H. C. Philippi, A. C. Herre.
Cheney.	State Normal School.	J. W. Hungate.
Ellensburg.	State Normal School.	J. P. Munson.
WEST VIRGINIA.		
Athens.	Concord State Normal.	
Fairmont.	State Normal School.	E. L. Lively, H. J. McGinnis.
Glenville.	State Normal School.	
Harper's Ferry.	Storer Coll. (Colored)	Wm. A. Saunders, Mrs. Alice M. Metcalf, H. H. Winters, H. T. McDonald.
Huntington.	Marshall College.	E. E. Myers, J. M. LeCato, Mary Donaldson.
Institute.	W. Va. Colored Insti.	
Shepherdstown.	Shepherd College.	
West Liberty.	State Normal School.	Callie W. Curtis.
Smoot.	Greenbrier Normal Sch	
WISCONSIN.		
Algoma.	Door Kewanee County Training School.	
Alma.	Buffalo County Training School.	
Antigo.	Langdale County Tr. School.	
Berlin.	Green Lake County Tr. School.	
Columbus.	Columbia County Tr. School.	S. M. Thomas, Velva Bradbury.
Eau Clair.	Eau Clair County Tr. School.	F. E. Jaastad, Frank A. Wilkins, G. R. Ingalls.
Gay Mills.	Crawford County Tr. School.	
Grand Rapids.	Wood County Training School.	W. W. Clark, Lillian McDirmid.
Janesville.	Rock County Training School.	
Kaukanna.	Ousagamie County Tr. School.	G. H. Bretnell, J. A. Fairchild, A. H. Bernard.
La Crosse.	State Normal School.	
Ladysmith.	Rusk County Training School.	

Manitowoc.	Manitowoc County Tr. School.	
Medford.	Taylor County Training School.	
Menomonie.	Dunn County Training School.	
Menomonie.	Stout Institute.	
Merrill.	Lincoln County Training School.	W. A. Clark, A. H. Cole.
Milwaukee.	Nat'l German American Teacher's Seminary.	H. A. Losse, John R. Thiel.
Milwaukee.	State Normal School.	
Monroe.	Green County Training School.	
New London.	Waupaca County Tr. School.	C. B. Stonely, Maud E. Guest.
Oshkosh.	State Normal School.	E. A. Clemans.
Philips.	Price County Training School.	
Platteville.	State Normal School.	Fred T. Ulrich, L. V. Starkey, G. E. Wilson.
Reedsburg.	Sauk County Training School.	Julia A. Davis.
Rhinelander.	Oneida County Train- School.	W. D. Juday.
Rice Lake.	Barren County Training School.	Geo. M. Snodgrass.
Richland.	Richland County Training School.	
River Falls.	State Normal School.	W.S. Well, A. C. Kuenning, J. M. May, E. J. Prucha.
St. Croix Falls.	Polk County Training School.	C. W. Monty.
Steven's Point.	State Normal School.	
Superior.	State Normal School.	T. J. McCarthy.
Viroqua.	Vernon County Training School.	
Wausau	Marathon County Training School.	
Whitewater.	State Normal School.	W. S. Watson, Arthur A. Upham G. A. Smith.
So. Kankarena.	Outagamie County Training School.	John E. Hale.
WYOMING.		
Laramie.	State Normal School.	Ruth Adset.

Control of Flies as a Nature-Study Problem

C. F. Hodge
University of Oregon, Eugene, Oregon

"As for the typhoid fly, that a creature born in indescribable filth and absolutely swarming with disease germs, should be practically invited to multiply unchecked, even in great centers of population is surely nothing less than criminal."—L. O. Howard.

Present Status of the Problem. From Maine to California the fly furnishes the best problem to use as an entering wedge to start us thinking about community effort—"co-operative good will" — for cleanliness and comfort in our homes and for good health, both of ourselves and our domestic animals. Since the fly combines the deadliness of effective contact - infection between filth and persons and foods, with the impossible - to trace air-carriage (now discredited, except in connection with this, or some other, FLYING germ carrier) extermination of flies becomes logically the first step in effective disease prevention. It is sheer waste of time to quibble about the exact number of cases of this or that disease known to have been carried by flies. No man ever did know, and never can know, all the places a fly has visited within a day, or even an hour, of its alighting on his food. The only way to settle all these questions is to eliminate this dust of Xes—unknown quantities—from our health equations—get rid of the flies entirely—and then see where we are. We have the statistics by which to compare past with present conditions.

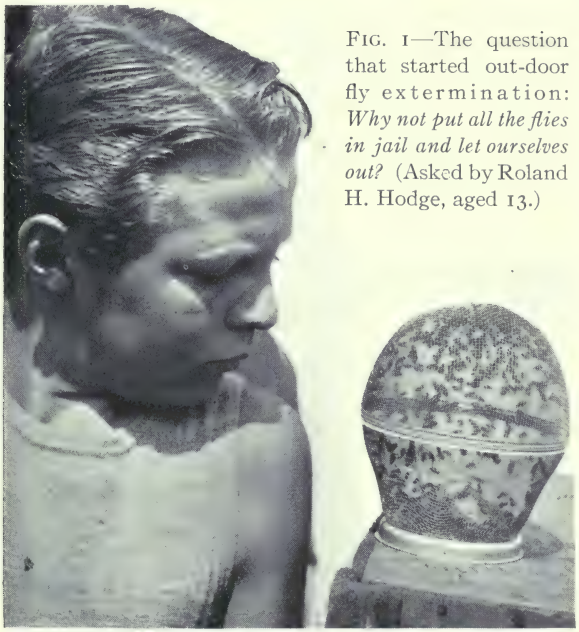


Fig. 1—The question that started out-door fly extermination: *Why not put all the flies in jail and let ourselves out?* (Asked by Roland H. Hodge, aged 13.)

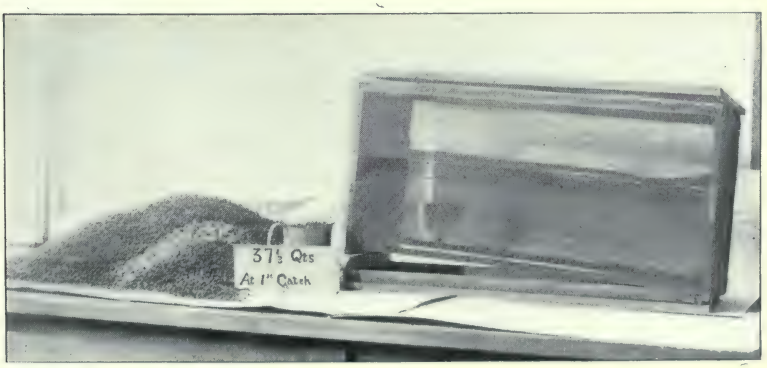
It seems little short of murderous, according to recent observations (or experiments?) to let the flies kill the babies in one New York City block, while some attempt is made to control them in another, if the flies might have been eliminated from both blocks.

Fly campaigns are never started early enough in the season. One manual training class took nearly three months to make one fly trap apiece. Any boy, handy with tools, ought to make the trap described below, the first one in at most two hours and subsequent ones in less than one hour apiece. We ought to take a few sharp lessons on the fly early in the fall, when they are most troublesome, and then get our traps and nets all made during the winter and so have them ready to use with the first move of the enemy in the spring. It is slowness in starting in the spring, which allows fly breeding to begin, that is fatal to complete success. Another common mistake is to waste too much time and give too much attention to breeding material. No amount of this can ever produce a single fly, if there are no breeders to lay their eggs in it. By strict attention to the over-wintering breeders isolated homes may be so completely rid of the pests that screen windows and doors may be dispensed with and meals enjoyed on unscreened porches with not a single fly at the table, while homes near by are swarming with them. Even under city conditions, Dr. Jean Dawson, co-operating with the school children, freed residence sections of Cleveland of flies so that the writer did not

FIG. 2—Stable Window Fly Trap. Set one week,

see one inside or outside of the house where he lived from August 15–23, 1913. In walking round and through the large public market in Cleveland he counted just seven flies. Going direct to Buffalo, the flies were like dust everywhere along the streets. He actually counted 21 flies on his table in the dining room of the Iroquois Hotel. In this respect the filthy condition of Buffalo, as a meeting place for the World's Congress of School Hygiene, was an international disgrace. The Boards of Health of both cities had given the matter much attention, but one had followed a definite plan of killing the early spring breeders, the other had not. Washington, D. C. ought to be the model city of the world and it is sometimes referred to in the papers as "flyless." Conditions are much improved over those of three years ago, but the Public Market, according to the writer's observations on July 3, 1915, left much to be desired. Flies were swarming over foods of all sorts, absolutely unprotected, and he actually caught about 50 flies with one sweep of the hand over a crate of blackberries. This is evidence enough that the campaign work in Washington had not been rightly managed.

It is plain, too, that the apparatus we use—even to the crack at the bottom of a fly trap—may make the difference between success or failure in a fly campaign. Most fly traps are made altogether too wide open at the bottom. Every hungry fly will squeeze through any kind of a crack to get at attractive food. With no other food about, we may thus attract every fly to our traps. Now if they go in to the bait, and then run out again—



has caught 37⅓ quarts of flies.—FIG. 3

as I have seen them do constantly in the ordinary traps—we have been giving them food to make eggs with. The crack at the bottom, through which the flies go in must not be over one-quarter inch wide, and it must open *up* toward the bait, so that a fly, after feeding, will have to crawl *down* in order to escape. This it almost never does, hence with a trap rightly made we catch all the flies that are attracted to our baits. The fly possesses no more cunning than shot rolling off a roof, hence it is only a matter of mechanical arrangement to catch the last one as easily as the first. This point is illustrated in Fig. 4.

The net, too, is a "GETTHELASTONE" proposition for any stragglers about the house that are attracted to the kitchen rather than to the traps at the back door or in the barnyard. If ready for them early in the spring, we shall have to catch very few in order to make extermination complete.

Just now the wildest confusion reigns as to plans and methods. For in the same breath we are told to kill the last fly and be sure to screen all doors and windows. Clearly, if we really did the former, we could save the expense and be free from the nuisance of screens. The most illogical and impossible directions are issued regarding disposal and treatment of refuse matter in which flies may breed. "Fly tight" stable receptacles have been widely ordered by boards of health, entailing considerable labor and expense. The writer has inspected hundreds of these and has yet to see the first one really fly tight. The material in all of them in fly time has been rolling with maggots, because most of the eggs are laid before the material is put into the receptacle. We do not need to incur this labor and expense, if there are no breeders. Time consuming, laborious and somewhat expensive methods have been worked out for chemically treating barnyard manure to prevent maggots from developing in it. First powdered borax at the rate of 0.62 pound per eight bushels or ten cubic feet (works better, if applied in solution or if wet down after the powder has been evenly dusted over the pile) was recommended. This was found to kill about 90 per cent of the maggots, (how easy in comparison to catch 100 per cent of the flies after they had hatched, or before they laid the eggs) and if used on the land at the rate of more than 15 tons per acre, it was likely to be injurious to crops. The cumulative effects upon the soil of successive applications is also unknown. However, borax may be used to

advantage on earthen or wooden stable floors or on decaying matter that cannot be used for fertilizer. To avoid the dangers to the soil of using borax, hellebore has been later recommended. Mix one-half pound powdered hellebore with ten gallons of water, allow to stand 24 hours and then soak down the manure at the rate of one gallon per cubic foot. This is said to kill from 88 to 99 per cent of the maggots, and not to endanger stock, unless

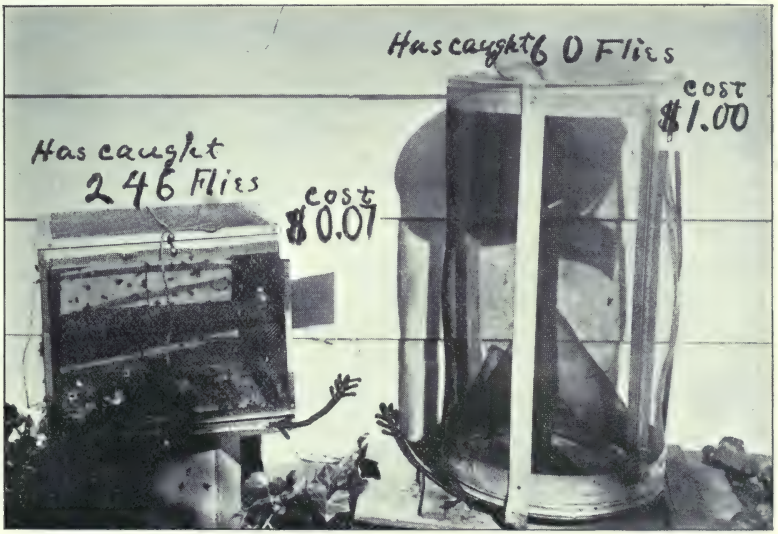


FIG. 4—Difference in result made by the *crack underneath* a fly trap.

Test made June, 1915, by dividing bait into two equal parts, putting one-half under each trap. Result indicated at end of day. The large store trap has an opening of 1 inch around bottom, through which the flies run in to bait and freely *out again.* The *Getthelastone* trap has a ¼ inch crack opening upward to bait, and all the flies that go in are caught. It would probably have caught nearly twice as many flies, if the big trap had not been freely *feeding the pests* close by. Photograph by C. F. Hodge.

the animals drink the mixture, poultry being warranted to suffer no bad effects from eating the poison soaked grain or the poisoned maggots, but no adequate experiments are cited to prove this. Now compare the labor, nuisance and expense of this plan with permitting the breeding flies to walk into a trap in the barnyard. There is the water to pump and lug, the mixing to attend to at the proper times, the treatment of the manure and finally the tons of sloppy manure to pitch, haul and spread—and to wade around in in barnyard, manure shed or pit—and even with all

this labor and nuisance, we leave from one to twelve per cent to keep up the egg laying.

The latest scheme of the Department experts is the cement-basin maggot trap described in Farmers' Bulletin, 679, July 14, 1915. For the accommodation of the manure from four horses—while it pollutes the air and goes to waste for four months—a slatted platform is built 20 feet long and 10 feet wide. The legs of this platform support it one foot above the cement basin, four inches deep—size not specified—which looks from the picture to be at least 11 by 22 feet. This basin drains to one corner and is kept with water one inch deep in the shallowest place, and it must be drained and the accumulated filth, with the living, dead and rotten maggots that may be caught in it scrubbed or hosed out of it at least once a week—a job disagreeable enough to drive any hired man away from the place where he was required to do it. This device depends for its effectiveness on the fact that maggots, when they reach their growth, tend to migrate out of the pile to a dryer place in which to pupate. Hence, again, the manure must be kept "well moist" i. e., "a few minutes each day are necessary to water the manure after the stable cleanings have been added to the heap." Properly managed this trap is said to catch 99 per cent of the maggots and to reduce the flies "at the barn and around the college kitchen from 67 to 76 per cent" (when $0.10 worth of screen wire in a trap managed with one per cent of the time and labor, and one one-thousandth part of the nuisance, might have cleaned up 100 per cent of the breeders).

No statement of cost, nor anything complete as to specifications, is given for this demonstration maggot trap at the Maryland Agricultural College. It is said, however, to be 'simple, easily constructed, and cheap." "Practically the only cost is the initial one of construction." Certainly no wooden, slatted platform could stand up under a mass of "well moist" manure for many months, and if the basin is to hold water and withstand heaving and cracking in winter, it would need to be solidly built on well drained foundations at a cost for labor and materials of probably not much below $50.00 for the size indicated. In the end we have such a filthy looking outfit, and one so likely under the least neglect to breed mosquitoes or raise a stench, that no town or city health officer could possibly grant a permit to build one within his jurisdiction, and since no farmer would ever be impractical

enough to build one, we fail to see the use of publishing this device.

In connection with all the schemes and devices in the field

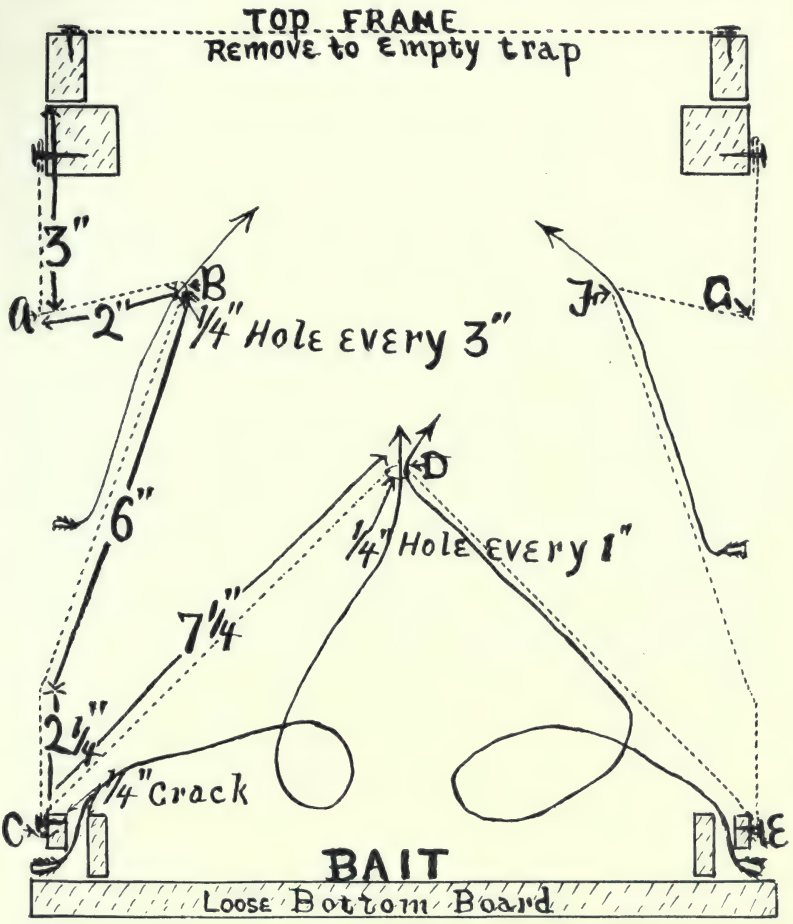


FIG. 5.

there are many so foolish, expensive and laborious that to even mention some of them in campaign plans would only invite sure failure. Since the failure of one member of the community to co-operate may spoil the whole campaign, our plans must be so all compact of pure goodness and common sense that everybody

will be convinced and see the need and really wish to do his part. Development of "co-operative good will," in a community, with the basis of general knowledge necessary to it, is the vital end in view, and this most precious community asset cannot be formed around foolish proposals or objectionable selfish schemes.

Education about the natural history of flies—their feeding and breeding habits and what they do—is, of course, in order; and especially ideas of real cleanliness in disposal of garbage and stable wastes and any other organic matter. While no amount of this matter will breed any flies, unless the breeders are there to lay the eggs in it, decency on other accounts, requires that it be put into or on the ground daily in warm weather. If spread thinly, it will dry out, and slowly disintegrate as rains beat it into the ground, or if raked into the surface the bacteria of the soil will take care of almost unbelievable quantities of organic wastes without the least nusiance and so quickly that flies cannot develop. Fresh lawn clippings, or weeds, for example, if left in a heap may quickly become a nuisance by rotting, whereas, if spread thinly about the roots of trees or between rows of berry bushes or corn become valuable mulch.

One important fact, proved by recent experiments of the Department of Agriculture, is that flies are unable to find foods among the animal wastes of stables with which they can produce eggs. Mosquitoes may subsist for some time on vegetable juices, of fruits, etc., but cannot make eggs until they have filled with blood. So flies require rich foods like milk, eggs, meat, etc., in order to develop their eggs. This greatly simplifies the problem. By care against leaving fly foods uncovered and against scattering or slopping them about, we can starve the flies into our traps and so effectually prevent breeding.

Finally, clear headed, logical, really easy, effective and economical fly prevention consists in getting all the breeders, letting them trap themselves, before they have time to lay their eggs. This done, we can dispense with screen windows and doors, tanglefoot paper and dangerous fly poisons, laborious treatment of stable wastes and maggot traps, and be free from the world's oldest, most troublesome and dangerous pest.

What flies do. During the war with Spain the United States had 20,788 soldiers wounded and 1,580 killed by typhoid fever. It was found that flies spread this infection and Dr. Howard,

in consequence, rechristened the insect the "Typhoid Fly." Since 1898 the evidence has been piling up to prove that flies carry many other filth-disease infections, and Dr. Stiles, of hookworm fame, suggested the appropriate name, "Filth-Disease Fly." No complete list of all the diseases that flies may carry has been compiled, but breeding as they do in all kinds of decaying filth, and feeding and dabbling in all manner of germ laden matter, they may spread practically any infection with which they come in contact. As many as 6,600,000 bacteria have been washed from the out-

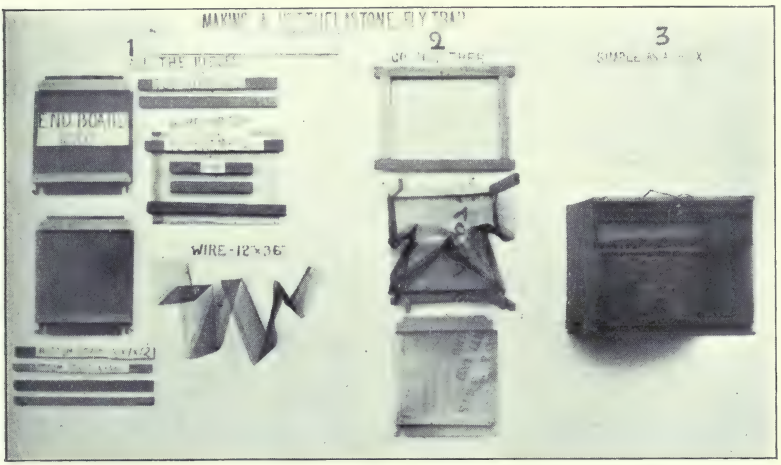


FIG. 6.

side of one fly and over 90,000,000 have been found in the crop and intestines of a single specimen, many of which are discharged alive in "fly specks." We are having millions of cases and are losing 70,300 babies a year by fly-time "summer complaint," most of them caused by fly borne infections, especially from filth to milk.

Local Problems. Make a list of all cases of sickness in the neighborhood, and try to determine for each one how the disease was caught. How many might have been contracted from flies and from fly infected milk or other foods. Include all diseases of animals, glanders, hog and fowl choleras and tuberculosis, pneumonia, foot and mouth disease and any others.

Different Kinds of Flies. How many different kinds of flies do the pupils know? (About 43,000 species are known to science.) How many different kinds can the pupils collect? (Collecting may all be done without so much as touching a fly.) What does each kind do?

House Fly, Typhoid Fly, Filth-Disease Fly. This species constitutes over 95 per cent, generally, of the flies about homes and is the one that causes most of the annoyance, filth and disease—the one we are chiefly fighting. House flies breed mainly in horse manure, but may do so in any fermenting or rotting vegetable or animal matter.

Bluebottles, Green Bottles, Big Gray Blow Flies. These flies are scavengers and lay their eggs on meat, but we can dispose of dead animals in more sanitary ways than leaving them to blow flies. They spoil a great deal of fresh fish and meat about our markets and homes. Closely related to the blow flies is the screw worm fly of the South, which lays its eggs in open wounds, the maggots feeding on the living flesh. They also oviposit in catarrhal nostrils or running ears of children or of persons asleep out of doors in the daytime, the maggots causing painful and even fatal wounds.

Stable Fly. This fly has a sharp proboscis with which it pierces the skin and sucks the blood of animals and man. It breeds in rotting straw or hay or strawy manure. This fly may inoculate the germs of infantile paralysis when it bites. The same germ, it has been claimed, causes limberneck in chickens, and maggots in fowls dead of limberneck may spread the disease to other animals or to man. We should burn all such chickens as soon as any signs of the disease appears, and be careful in handling them.

Horn Fly. This is the small, dark fly that infests cows and bites, often, by night as well as by day. They often cluster in masses on the horns. They lay their eggs in fresh cow droppings, where they may often be killed by the hundreds with sprays, or the eggs or maggots may be killed by covering the material with lime. This fly was accidentally imported from Europe in 1886 and has since become one of the most serious pests of cattle over the entire continent.

Black Flies, or Deer Flies, are a pest of fishermen and animals. They breed in running water, often in the waste water about wells

and watering troughs. They are suspected as possible carriers of pellagra.

Mosquitoes are fly-like insects, now well known to carry the germs of malaria—chills and fever, ague—and yellow fever.

Fleas are practically flies without wings and were long classed with the flies. Each kind of animal is likely to be infested with its peculiar species of flea. The rat flea spreads the germs of bubonic plague from rats to man. Other fleas are being studied to find out which one, if any, transmit the germs of leprosy.

Tachina and Syrphus Flies are beneficial because they lay their eggs on, or near, other insects and the maggots feed upon and kill them. A number of kinds are being imported by the government to control the gypsy and brown-tail moths.

Life History of House Fly. (*a*) *Eggs.* Will several of the pupils volunteer to find and bring in the eggs? (These may be found about fresh horse manure from April or May to November, or a number of flies may be kept in a cage of screen wire, or mosquito netting, with a glass jar of fresh horse droppings in it, and the eggs be secured in this way. Feed the flies well with milk and watch for them laying, and look for eggs near the bottom of the jar.

(*b*) *Maggots.* If the eggs are secured, the rest of the life history may be observed as the maggot develops in a glass jar of horse manure. They will transform into puparia, generally at the bottom of the jar, and finally emerge as adult flies. (Nothing puts more fight into a community than these lessons and no one who has worked them through can eat food on which they have seen flies.)

(*c*) *Time Relations.* Keep all dates carefully. In warm weather eggs may hatch in from 12–24 hours, the maggots attain their growth in from four to seven days and the adults emerge in about 10 days. The females must then feed for, generally, eight to fourteen days before they mature their first batch of eggs. This fact is of utmost importance in making plans to get rid of flies. With an effective trap, properly baited and managed, in the stable window or barnyard and outside the kitchen door how many flies would be likely to feed for this length of time without getting caught? If thay all caught themselves, how many flies would we have at the end of two weeks?

Cost to the Community of Fighting Flies, and cleaning up their filth. Figure for the season cost of foods spoiled by flies, and cost

of cleaning flyspecks from windows, woodwork, chandeliers. How much do screen doors and windows cost each family a year? Tanglefoot paper? Fly poisons? Fly swatters? Fly traps? (Fly screens have been estimated to cost the country $12,500,000 yearly.)

Plans and Methods of Controlling Flies. Study and discuss with the class all the different devices and plans of campaign used in the community. Which are best? Which possible, and which, impossible to get everybody to unite upon? Can any of them be depended on to get the last pair of flies in the town and the first pair that comes from outside?

(*a*) *Plan of Keeping Things Clean.* Exactly how must we do this for a town or city home so that flies cannot breed anywhere on the permises? (House flies have been bred out of the snuff on a druggist's counter. They may breed in rotten lawn clippings, or weeds or in decaying garbage, fruit or vegetables, as well as in the waste of stables or the poultry yard or pigeon loft.) In town or city schools ask each pupil to tell, or write, exatcly what is being done and what each thinks his people ought to do and can do. Is it humanly possible for any town or city to keep, or treat, all fly breeding material so that flies cannot multiply in it? If not, what must we plan to do? (trap the breeders.)

(*b*) Do the same for the farm home and district in a rural community. How can a farm dispose of its barnyard manure so that flies cannot breed in it? (If spread daily it will generally dry out or rot too quickly for eggs to hatch and maggots to develop in it. This plan, too will save handling the material but once and will conserve from half to three-fourths the fertilizer value, compared with the old, filthy way which necessitated piling and allowing to rot. How many farmers in the district get contents of barnyard to the soil daily in warm weather? Has any farm adopted the plan of treating all stable manure with borax? With hellebore? Even with all stable refuse hauled out, or treated, daily, how may breeding be prevented in pastures and hog lots? and roadsides? (Only by trapping the breeders.)

(*c*) Compare in cost, labor and effectiveness all the other plans in the field with that of consistently trapping the breeders, out of doors, about every home and barnyard, wherever they exist; to have in doing this a fly trap that catches all that are

attracted to it and does not feed the flies and let them go; to have also some device—like the net described below or something better—to insure easily picking up stragglers that escape the traps, and would otherwise keep up the egg laying and prolong the fight indefinitely. This plan may be carried into effect any time during the year when the flies are active, in spring or summer or early fall. Late in the fall flies become sluggish, are not hungry and, hence, are not easily attracted to baits and are chiefly concerned in crowding into houses for warmth and protection. It is best to begin as soon as flies appear in the spring, be sure that every home is supplied with traps and nets in good season, and continue as long as any flies are emerging from winter quarters or hatching out of the barnyards. Flies emerge from winter quarters hungry and if traps at this time are properly managed, very little will remain to be done with nets or swatters.

FIG. 7.

The Traps. The principle upon which fly traps are made is that flies tend strongly to crawl upward toward the light, especially after feeding. (When seeking food or a place in which to oviposit, they may crawl downward into dark cracks.) Hence by arranging cracks and holes in screen wires which open upward, we can make a simple and effective fly trap of any size we wish. The trap described below was first designed to fit in a stable cellar window, the window in some sunny corner out of the wind, where all the flies of the barnyard tend to congregate. In this position the trap-folds in the sides do practically all the work. In case of a tight stable, with sacks hung over all the other windows—to darken them and flap in the wind—sooner or later every fly will attempt to go in or out of the trap window and be caught coming or going, stable flies horn, black and even bot flies and mosquitoes, that are not attracted to baits, and if the window trap is well baited, we may establish a whirlwind focus for house and blow flies as well. If the stable is open and full of cracks, the trap should be made without bottom board and set over a ridge of attractive bait on the manure pile, or in the most likely place in the barnyard. It is well to plan traps to take wire screen of standard widths—24 inches wide by 30 inches high and 12 inches thick is a good size for a large dairy or farm barnyard, and it is well to have two trap folds on each side, one about the middle and the other about three inches from the top. The best size for house-yard is 12 inches wide and high and 10 or 12 inches thick, and with waste box lumber a boy can construct this at a cost of about $0.07 worth of screen wire.

Fig. 6 gives steps in making the traps taken from actual specimens in a manual training class. The rule in making is first to cut out all the pieces. Then every notch and cut can be made to fit its proper piece. The parts go

together as shown in 2 and 3 in Fig. 6. It is easier to tack the wire to one end board, to which its top-shoulder and bottom strips have been nailed, and then set the other end board in place. The complete specifications for a trap 12 by 12 by 10 inches will be:

Two one-half inch end boards 10 by 12 inches (with cleats if necessary). Two top shoulder strips one inch by one inch by 11 inches long. Two bottom strips one-quarter inch by one-half inch by twelve inches long. Two bottom strips one-quarter by one inch by twelve inches long. Two top frame strips one-half inch by one inch by twelve inches long. Two top frame strips one-half inch by one inch by nine inches long. Screen wire for top frame ten inches by twelve inches. Screen wire for sides and bottom twelve inches by 39½ inches. (Fold down wire one-quarter inch at each end, and fold squarely at angles indicated in Figs. 5 and 6. Cut the wire one-half inch in at angles A, B, C, D, E, F, G, in Fig. 5 and bend the one-half inch flaps at right angles so that bottom ridge and trap folds of sides can drop smoothly between end boards. Begin tacking the wire at bottom corners then draw to top corner and tack so that the trap folds at B and F are not less than 60 degrees. Flies will not crawl up to the holes, if the folds are too sharp. Finally punch one-quarter inch holes three inches apart in the side folds and one inch apart in the bottom ridge, This is done by setting in as many spikes as there are holes, then drawing them out together—to avoid closing some holes while the others are being punched.

The first model of this trap merely set on a pile of filth where flies were swarming caught 37⅛ quarts in one week (about 370,000) without bait or attention of any kind. This ought to prove a GETTHELASTONE proposition for dairies and farm barnyards, and if for a few cents worth of screen wire we can let the breeders trap themselves at this rate, why resort to the more expensive and laborious methods? The boys, in connection with their manual training, can make models for demonstration, and can see to it that the barnyards are fitted up with them early, and if this is done for every home there may be no need for screen windows or doors so far as flies are concerned.

The latest addition to this trap is a bottle of formalin (four teaspoons full to the pint of water) stoppered with wicking and hung to one end board inside the trap. Flies are thirsty animals and drink the formalin water as fast as caught. This device does away with the objection some people feel to seeing the flies buzzing around—"suffering"—in the trap, keeps the trap cleaner, and makes it possible to empty it any morning without having to spray with gasolene or formalin to kill the flies. Other poisons might be used, if at hand.

Fly Foods and Baits—Management of Traps. Study and observe continually all the things flies are most strongly attracted to about the home. We need to study the foods and feeding of flies even more carefully than we do the materials in which they breed. They cannot lay eggs until they find food to make them out of. In every case in which the traps are not catching all the flies the reason is that they are finding food outside the traps. We must hunt this up and bury or burn it, and when we do this thoroughly, one trap is just as good as ten about a barnyard: for it may take a fly but a few seconds to go a quarter of a mile toward the only food it can smell. The idea is to keep the most attractive bait we happen to have under the trap all the time. Fresh fish or poultry cleanings (will attract all of the blow flies about the place, as well as the house flies) milk, both fresh and

sour, except where flies have free access to it, as in dairies and where pigs or poultry are fed with it, decaying bananas or banana skins, stale eggs, brown sugar, or molasses, mixed with diluted vinegar, a stale crab, or crab shells, will attract flies away from almost everything else. Flies are most strongly attracted to anything that is fermenting actively, and the best bait may be made by mixing a thin bran mash (one pint potato water, one-quarter pint molasses, one-quarter pint milk, one-half pint bran) with plenty of active yeast. Stale beer attracts flies by its odor of fermentation.

This is important. Keep your fly trap a good distance from the house, in the barnyard, back by the alley fence, near the poultry yard, all the while attracting the flies away from, rather than toward the house. By this plan, too, we can use more effective baits without offence, and pick up the flies before they come near the house at all.

Getthelastone Fly Nets. With the out-door traps to catch almost all, what do we have with which to insure picking up the last fly that finds its way into the house? The swatter comes the nearest to doing this, but this is very laborious and slow and filthy. If we swat a fly, we must pick it up and put it in the grate, or we are likely to eat it and breathe it as dust a little later. Small butterfly nets with handles long enough to reach ceilings without stretching, and floors without stooping, with which we can sweep up the swarm hovering under the chandeliers, are cleanly and strictly getthelastone weapons. With one of these nets not a fly can escape. With a few quick sweeps we pick them all up and then tap the net lightly over the porch rail (we do not need to strike hard enough to smash the flies and soil the net) and turning it inside out, we wipe the flies into the edge of the flower bed with the foot—all caught and out of the house in one operation. Using the nets is good sport for children, and furnishes the means of a lively game. Give each child a net and let them all start at a signal—about the schoolrooms or yard, dooryard or barnyard—and in five or ten minutes give the recall signal, and the one, or the side, that has the most flies wins the game.

These nets are made at a cost for materials of less than two cents apiece, the materials being *fine mesh*, plain white mosquito net, a piece of spring steel wire (bale wire does very well) and a switch from the willows, shrubbery or orchard prunings. Do not try to make the nets out of cheese cloth, tarlatan, bobinet (too expensive and lasts no longer) or the common coarse-mesh mosquito bar. Order in season and have your merchants get plenty of the fine-mesh netting, 72 inches wide, or the widest obtainable, and cut six nets to the yard, being careful to make them long way of the net the long way of the piece i.e., the double threaded warp must run the long way of the net. Each net will then be about eight inches in diameter and 18 inches deep. For use in dairies larger nets are better, to sweep up the clouds of stable and horn flies about the cows. Cutting four nets from a yard and a half yields about the right size, and we need of course, heavier spring wire for the frame. This size is also good for general insect collecting. In sewing up, first run a narrow hem along the top, to hold the wire, and beginning two inches down from this hem French seam the open side and bottom. Bend the wire into an eight inch circle, and, putting something smooth over the end, run into the hem, bend out the ends, cutting one off one inch and the other one and one-half inches from the net, bend a sharp right angle and cut off to a tack

point one-quarter of an inch from the tip. Place handle between wires and drive the bent tips into opposite sides, wind with tire tape or cotton twine, and the net is done. It makes a neater, firmer job, if we cut fine grooves in the handle where the wire shanks fall and press the wires smoothly into them as we wind to handle.

The name, "GETTHELASTONE FLY NET," may be printed on the nets before the wires are run in by means of a hectograph pad, or it may be done by running the nets, or the cloth, through a regular printing press. This carries a good suggestion and serves as a timely reminder. It is well to have them printed in colors, if they are to be distributed at a campaign rally, or at fairs or if they are made up for sale in the stores.

Multiplication of Flies. "*And he (Moses) removed the swarms of flies from Pharaoh, and from his servants, and from his people, there remained not one.* EXODUS VIII, 81. Allowing ten days to breed a generation, each female laying (one-half the flies are females) 150 eggs every ten days for six batches, and the young flies beginning to lay when ten days old, how many flies might be produced from a pair in three months—May first to August first? Have pupils who are old enough figure this out and compare answers. How do they agree with these figures?

May 1, we begin with two flies,	2 flies
May 10, we have	152 flies
June 10, we have	34,302 flies (or 4 quarts)
July 10, we have	72,280,800 flies (150 bushels)
Aug. 1, we have	5,746,670,500 flies (143.875 bu.)

Instead of soaking down tons of manure with hellebore water or building maggot traps, or shutting ourselves in jail behind expensive bars of fly screen, why not let this pair catch themselves May first? With an insect capable of such rapid increase, and since one—in the milk or gravy—is as bad as more, nothing could be more uninteresting than talk about reducing the numbers 67 or 76 per cent. We cannot hope to have people take any interest or put forth effort unless they can see the possibility of a clean job and definite relief from the pests.

Plan of Campaign. Is it possible to make a plan good enough to enlist every man, woman and child, or at least, some one person in every household in the community? This is the first thing necessary, because one family, not in the game, can make success impossible for all the rest. Let each member of the class work out in detail the best plan he is able to devise, discuss and compare them all, and finally draw up a workable plan and have it printed in the local papers. The following fall or winter plan to write up this story, tell all about how it succeeded and what changes you would recommend to make it better for the next season.

Co-operative good will must be the watch word and keynote of the whole campaign. It can, thus, be made a good natured game, and one of the most educative and enjoyable the community ever played. When this subject was new, it was not possible to secure the necessary co-operation. Now, is it too much to hope that everyone knows enough to, at least, try to play his part? Very few flies live through the winter in most sections of the United States. They come out of winter quarters hungry and if our traps are set and baited for them the day they first appear in the spring, they may all catch themselves, before they begin to lay. With everybody co-operating intelligently it would be wonderfully easy, and the best of good fun, to win the whole fight before the first of June and then enjoy the entire summer free from the time-old, world-wide plague and pest, "The house fly—disease carrier."

Conclusions. 1. Breeders, not breeding material, are the real source of all the flies of a season.

2. If your out-door trap is not catching all the flies in the barn-yard, or back yard, find out where the others are feeding and put a stop to it by burning, burying or covering fly tight.

3. One offended neighbor can easily raise flies enough out of spite to vitiate the best efforts of the rest of the community.

4. Be sure your plan of campaign enlists every home. Arrange to take care of all homes that are short-handed, have no children in school, are too busy or too poor, are foreign and unable to read or too ignorant or stupid to do their share.

5. Study the enemy and the problem so as to make the best of difficulties and failures in order to more complete success the next season.

6. Do the best you can to make garden or farm plans to get all fly breeding material on or in the soil daily. Anyway, get the breeders.

7. Quote Moses to those who claim that flies were created "for some good purpose." All we ask is: "*There remained not one.*"

Book Reviews

Studies of Trees. J. J. Levison. Pp. x + 253 John Wiley & Sons, Inc. $1.60

The number of books is evidence that the tree is excellent Nature material. In all of these books, the chief endeavor is to present the characteristics of the different species that render identification easy. That is well done for the common trees in this book. The first three chapters, containing 90 pages, are devoted entirely to this matter. Then comes a chapter on the life history of the tree, next an excellent chapter on what and how to plant, giving the lists of trees that are good for lawn, street, woodland. Chapter 6, on the care of trees, tells how to protect from the numerous insect pests, and gives a list of the more common sorts. It describes the common tree diseases, also, and the methods of prevention, as well as the treatment of injured trees. Chapter 7, on forestry, is one that every public school pupil should read, for it presents concisely the reasons for, and the methods of conservation. Chapter 8 is on common woods. The numerous excellent illustrations greatly add to the value of the volume.

The author is to be congratulated on putting so much serviceable material into such small compass.

The Birds of Connecticut. By J. H. Sage, L. B. Bishop, assisted by W. P. Bliss.

This is Bulletin No. 20, of the State Geological and Natural History Survey, and is one of the publications that every bird student will want to add to his library. There is systematic treatment of the birds of Connecticut, with brief description, dates and places where recorded, nesting dates, and information regarding migration. A very full bibliography, covering some 58 pages, is given. Nearly a hundred pages is taken up with the discussion of the economics of Connecticut birds, and a mass of facts is given for each group, and in many cases for specific birds, showing how valuable the ordinary birds are in keeping under control insect and weed pests. This is not only a record of many new observations, but there is given also a digest of many of the observations that have hitherto been made on particular species. Application for this bulletin should be made to the State Librarian of Connecticut.

Guide Book of the Western United States Part A, Northern Pacific Route. By Marius R. Campbell and others. $1.00.

This is bulletin No. 611, of the United States Geological Survey. A series of such bulletins is being issued with the view of putting into non-technical language such information as would interest the traveller in the several regions covered. This particular one takes the Northern Pacific Route. Excellent maps give consecutive sections of the route travelled, with descriptions of interesting features along the way accompanying them Much of the information is naturally physiographic, with sufficient geological information so that one may understand the surface features.

Many of the important towns are noted, with information regarding their activities. The book is well illustrated, and the traveller will gladly possess these guide books as an aid to intelligent travel.

Practical Zoology. By Robert W. Hegner. Pp. xv + 495. Macmillan Company. $1.40.

This book is cast on systematic lines. The first hundred pages are devoted to the economic insects. Then comes a chapter on classification, after which the rest of the arthropods are considered. Then follow chapters on the molluscs, the worms, the echinoderms, cœlenterates, etc., with about half of the book devoted to the vertebrates.

As a high school text, this should certainly be an improvement on most of the systematic treatises that have thus far appeared, for it deals with phases of the subject that are of direct interest to the average pupil. While many of the animals mentioned are not those of the child's immediate environment, most of them are, and natural history is of interest to the boy and girl even when the forms described are those of distant lands. It is a zoology that the nature student will use often as a reference book, and I know of none that would serve in the average school library better. If it is combined with a good deal of field work or is used in connection with laboratory work, it certainly should prove an excellent high school text. The book is well illustrated. Many of the illustrations, especially those in the chapter on birds, are from the author's own photographs.

Laboratory Outlines for Embryology. Mary T. Harmon. Pp. vi + 50. P. Blakiston's Son & Co. $.50.

This is a laboratory guide for use in connection with the study of the chick and the pig. It is purely a technical book. The laboratory descriptions seem clear and concise.

School Janitors, Mothers and Health. By Helen C. Putnam. Pp. 201. American Academy of Medicine. $1.00.

This book is dedicated to the American Association for the Study and Prevention of Infant Mortality. The subject matter is school house-keeping. It is written from the point of view of a woman and a physician. It is a high time that we keep our school houses as decently as our homes, for our children are exposed there to contagion, to unsanitary conditions of light, temperature and moisture, for long hours. This book is an appeal to the mothers to interest themselves in the problems of health of the child in the school. Chapter 1 is on the prevention of school fatigue; chapter 2 on mothers' clubs and clean school houses; chapter 3 on school janitors and health. Chapter 5 is exceedingly attractive—the training of janitors and sanitary care of school premises. It is brief, but very much to the point. This is not a book of theory, but a book of fact, for the women have been collecting data regarding school conditions and the facts as set forth are, to say the least, interesting. Here is one paragraph as a sample thought on page 136:

"Of the deaths between 25 and 34 years of age among all people in Michigan during certain years, one-quarter (25.8 per cent. was due to tuberculosis; but among teachers it was over one-half (52.4 per cent). Among all ages, only one-eleventh (9.4 per cent.) of the general death rate was due to tuberculosis, but among teachers the rate was three times greater (27.6 per cent.)."

Heroes and Great Hearts, and Their Animal Friends. By John T. Dale. Pp. x + 240. D. C .Heath & Co. $.60.

This is a reader including a combination of various selections about birds and dogs and other animals, mostly the familiar ones of the home, and bits of biology regarding the interest which great men have taken in the animals about them. The selections are as a rule very good, being taken with care from authors of good repute.

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Helen's Babies Christened

G. T. K. NORTON.

For a number of young hair and fur covered persons November 16th, 1915, will ever be a memorable day, for this was the day selected by New York City's Park Commissioner, the Hon. Cabot Ward, to christen the babies in the Central Park Zoo. The weather was beautiful, and the ceremonies were witnessed by scores of laughing visitors to say nothing of five moving picture cameras.

The christening was a large one, that is, seven animals were given names, but by far the most important and interesting part of it was the naming of the four lion cubs. These cubs were born on October 22d of Helen and Leo II. They are the sixth litter the lioness has had in six years which, in all, total twenty-six cubs. The names selected for them were Niger, Stanley, Sheba and Ayesha. The clumsy little animals are very valuable, playful, and always hungry; they are growing rapidly but will not be weened until six months old. They can be handled safely until they are three months old though even now they show their antipathy to humanity.

The other animals to whose cages white name cards were tied with blue ribbons by Dolores Rousseau, the little girl chosen for the unusual task, were a big male tiger from Southern Siberia, a tiny Zeabucalf, and a Zebra colt. The tiger which was named Dick II is said to be the largest specimen of the cat tribe in captivity. The little Zeabu calf was named Ganges; he took an immediate dislike to the "movie" men but after a taste of dry bread consented to pose. The Zeabu are worshipped in India and play

a part there similar to that of the famous White Elephant of Siam. Mexican cattlemen have discovered another use for the Zeabu however; they are breeding them with their native cattle and thereby securing a far superior herd. As a result the Zeabu is in great demand.

Sheik was the name chosen for the Zebra. He too objected to the cameras and not a picture was taken. Sheik is the first

The Christening.

of his kind ever born in any menagerie. He is unique in more ways than this for not only is he a stylish youngster with all his stripes, but he has also settled a question heretofore much discussed, the question being: Is the Zebra born with stripes? They are; Sheik has proved it and thus helped science on in it's forward march.

These babies, as well as all the others in the Zoo, stand as examples of what loving care and kindness can do even unto the

most savage of beasts. Head Keeper Bill Snyder, probably the best all around animal man in the world, is both their foster mother and father. Never a stick or whip does he carry, nor an angry word does he utter; he never shows fear toward "his pets" but always expresses love. To a beast they return this feeling, and no matter what the animal, be it lion or elephant, pelican or mongoose, or anything between, they feel his presence and bear his touch.

Four lion cubs chinning themselves. Week old.

The question of captivity lessening ferociousness of wild animals after several generations recently brought up by some animal men is interesting, and seems probable. Mr. Snyder says no. He bases his answer on twenty-eight years of experience, and the successful breeding of the finest collection of lions in the world.

Jenny and her week old baby. Only baby Zebra ever born in captivity. Central Park Zoo, New York City.

The Present Trend of Nature-Study in Wisconsin*

*Presented at the Annual Meeting, The American Nature-Study Society.

FRED T. ULLRICH

The spirit of education of the present age as reflected in the current educational periodicals, recent pamphlets and books and by the graduate courses in education in our universities and normal schools is to solve educational problems by the study of data made available in the operation of the various aspects of our great educational institutions. It is only by the collecting of this data, recording the same, noting the general tendencies and drawing conclusions, with many repetitions of these steps for each problem and invariably coming to the same conclusions that it is possible to make educational procedure scientific. Unless this is done it is not possible to get definite and reliable principles of education, but only an unsettling of educational practices with the advent of each new philosopher. It is with this basis as a conviction, that this study, the present trend of Nature-Study in Wisconsin, was attempted.

It would undoubtedly be of interest to know the present trend of Nature-Study in every state and territory in the union, but it is of peculiar interest to know this situation in Wisconsin. It is fair to assume that the introduction of vocational education into many of our schools has greatly modified the content and method of instruction in the old time subjects. Some of the questions that are being asked by those who are genuinely interested in the permanency of Nature-Study in the curriculum and are convinced of its indispensability in the best instruction of boys and girls in the elementary school are: What is the relation of Nature-Study to vocational training? Has the content of Nature-Study undergone any modification due to the introduction of vocational training? Should not the content of the subject be subjected to greater modification than is evidenced in our Nature-Study literature? There is no state in the central part of this country where suggestions in answer to these questions should be more significant or potent than in Wisconsin.

In the year 1911 a law was placed on the statute books of this state which provided for the establishment of industrial, commercial, continuation, and evening schools. According to this

law a state board of industrial education consisting of six appointive and three exofficio members shall have general charge of these schools; an assistant for industrial education appointed by the state superintendent shall have, with the advice, consent and direction of the state superintendent, general supervision; every town, village or city of over five thousand may have a local board of industrial education whose duty it shall be to foster and establish and maintain industrial, commercial, and evening schools; this local board shall consist of the city superintendent of schools, exofficio, or the principal of the high school, exofficio, or the chairman of the local board charged with the supervision of the already established schools (the high school principal shall be a member, if there is no city superintendent, and the chairman shall be a member, if there is neither city superintendent nor high school principal), and four other members, two employers and two employees, who shall be appointed by the local school board charged with the already established schools; the courses of study in these schools shall include English, citizenship, sanitation, and the use of safety devices and such other branches as the state superintendent and the state board of industrial education shall approve; the schools established shall be open to all residents of the towns, villages, and cities in which such schools are located; all children between the ages of eleven and fourteen not attending other schools shall be required to attend; further, all children between the ages of fourteen and sixteen, not regularly or lawfully employed in any useful employment or service at home or elswhere, shall attend these schools. This last section does not apply to any child who has completed the course of study for the common schools, or the first eight grades as taught in the state graded or other graded schools of Wisconsin and who can furnish proper diploma. In addition to this there are few other but minor exemptions from attendance at either the common or vocational schools.

These extracts from the school law of Wisconsin, which are taken almost verbatim, show the close relationship between the industrial, commercial, continuation, and evening schools, and the common schools of the state. From one point of view there is a dual system of education in the state while from another, since the chief administrative officer is appointed by the state superintendent, and the local board consists of the chief executive of the

common schools and members appointed by the local board in charge of the common schools, there is very close unification in the ideas that permeate and direct the two systems of schools. In the year 1914-1915, there were twenty-nine cities that maintained continuation schools in the state under the provisions of the law. The significance of the presentation up to this point is to emphasize that there is no state where vocational education has had such favorable conditions for influence on the point of view and content of the subjects that antedated vocational instruction, as in Wisconsin.

In this state the persons who are most largely responsible for the courses of study and the attitude toward a particular subject in the courses are the city superintendents, village principals, and the state department of education. Further, it seems safe to assume that the instructors in the higher institutions of learning, the normal schools and the university, exert no small influence in the determination of points of view in the various subjects taught in the courses in the schools of the state. Thus it was believed that a fair index of the present trend of Nature-Study might be obtained by securing a reaction to a questionaire relative to the matter under consideration. This questionaire made inquiry as to whether or not systematic courses in Nature-Study are taught in the grades of the town, village, or city schools; the objections to and difficulties in such courses; the aims of Nature-Study instruction in the primary, intermediate, and grammar grades; the extent to which prevocational courses are presented; the specific aims in these courses; the particular subjects in the grades other than prevocational subjects, in which special effort is made to emphasize the vocational aspect; and finally the objections, if any, to giving Nature-Study a vocational trend. A questionaire was sent to each city superintendent, every village principal in which the population of the village was 1000 or more, to the supervisory staff of the state department of education, to the principals of the training schools of the normal schools of the state, and to every teacher of science or near related subject in the eight normal schools of the state; 88 replies were received of the 153 sent to city superintendents and village principals, and 46 replies of the 81 that were sent to the training school principals, members of the state department, and teachers of science and near related sub-

jects in the normal schools. In the tabulation and analysis of the replies, those from the city superintendents and village principals were put into one group, and all others into another group.

The weight and consideration that should be attached to the answers that relate closely to the chief matter of interest in this study, namely, point of view and content of Nature-Study courses, will depend in no small measure upon the extent to which Nature-Study is taught in the state. It is a source of regret to find that only 16 schools or 19% of the schools from which reports were received on this question give systematic courses in Nature-Study; 21 schools or 24% give incidental but not systematic instruction, while 49 or 57% report that systematic instruction in Nature-Study is not attempted, wtih no suggestion that the subject is presented even in an incidental way, such as, material for general exercises. Fifty distinct answers in the way of objections to or difficulties in the presentation of systematic courses were noted; 24 or 41% report "lack of time or too much crowding of curriculum," 16 or 27% "unpreparedness of teachers to give the instruction," 7 or 12% "lack of relative importance when compared with other subjects of the elementary school," 3 mention "nothing has been introduced along this line," 2 that "materials of the course are not organized," and 1 each, "courses get stereotyped and formal," materials not available," "lack of definite purpose," "work too wishy-washy," "too much manual work," "large foreign element" and last but most interesting of all, 'it is not always timely to be too systematic in this work. You may wish to teach monoecious flowers April 30, but the Lord may not send them until May 30." The members of the supervisory force of the state department, the principals of the training schools and science instructors in the normal schools give 19 distinct answers in the way of difficulties, 13 or 68% report "lack of qualified teachers for the instruction," 13 or 16% "an over crowded curriculum," one says "apriori belief of many schoolmen that science cannot be taught to children," another "tendency to humanize knowledge forgetting that Nature-Study may be humanized," and still another "courses that are offered are usually neither fish nor flesh."

The aims of Nature-Study given by the city superintendents and village principals were quite readily and satisfac-

torily grouped under observational, disciplinary, aesthetic or appreciative, ethical, scientific-method, preparatory, knowledge, and economic or vocational aims. A few sample quotations will show best the type of answer put under each of these aims; observational aim, "to train powers of observation," "habit of observation," "sharpening of perceptive powers;" disciplinary, "to develop the senses of pupils;" aesthetic or appreciative, "love of nature," "to enjoy the whole out-of-doors," "to appreciate nature and to stimulate a greater love for plants and animals;" ethical, "respect for law and order in the universe," "a reverence for the Creator of all things," "better attitude toward life;" scientific-method, "to see and interpret things," "to train in scientific thought," "interpreting life and experience;" preparatory, "the understanding of nature as a basis for the study of geography," "gives basis for work in drawing, geography, English, and general science," "builds up a body of information which becomes foundation in later science work;" knowledge, "to give wider and richer environment," "acquaints students with the law of nature," "to give knowledge of birds and bird life;" the economic or vocational, "economic importance of the same," "to care for health," "leads to a protection of birds and wild flowers." The city superintendents and village principals gave 123 distinct aims for Nature-Study in the primary grades. No particular aim was recorded more than once for the same person reporting, but when the person gave a number of different aims, which was usually the case, credit was given for each aim that was listed. On this basis 34 or 28% of the aims emphasized the aesthetic or appreciative aim, 26 or 21% the observational, 23 or 19% the knowledge, 16 or 13% the preparatory, 13 or 10% the ethical, 6 or 5% the scientific-method, 3 or 2% the economic or vocational, and 2 or 2% the disciplinary.

A similar classification of the aims of Nature-Study in the primary grades by the supervisory force of the department of education, principals of training schools and science teachers in the normal schools, out of a total of 66 distinct aims, shows that 13 or 20% emphasized the observational aim, 13 or 20% the aesthetic or appreciative, 13 or 20% the knowledge, 10 or 15% the preparatory,6 or 9% the scientific-method, 4 or 6% the ethical, 4 or 6% the psychological, and 3 or 5% the economic or vocational. In the classification of aims for the second group

the term " disciplinary" is omitted and the term "psychological" is introduced. The term "psychological" was used to include such aims as "self-activity," "give a sense basis for concrete thinking," "to find the child's interest, to direct that interest and to create interest where none exists." It is clearly evident that both groups of educators agree that in the primary grades the aesthetic or appreciative, the observational, and the knowledge aims are the most important; the preparatory, ethical, and the scientific-method aims are of less moment; while the psychological, the disciplinary, and the economic or vocational are of the least significance. Two things should be especially noted in these results, first, the lack of interest in the disciplinary aim which is undoubtedly due to the passing of faculty psychology, and second, a minimum of value attached to the vocational aim in the presentation of Nature-Study in the primary grades.

In many instances the aim for Nature-Study for the intermediate grades were the same as those for the primary grades, with the exception that the aims of Nature-Study for the primary grades were extended to fit the mental development of intermediate grade pupils. In case there was differentiation in the aims for these two classes of pupils, the only aims tabulated for the intermediate grades were those that had not already been listed for the primary grades. A summary of 19 distinct aims for the intermediate grades by the city superintendents and village principals revealed that there were 9 or 47% additional for the scientific-method aim, 3 or 16% for the knowledge, 2 or 11% for the preparatory, 2 or 11% for the aesthetic or appreciative, and 1 each or 5% for the observational, the ethical and for the economic or vocational aims. Similarly, a summary of 28 additional aims for the intermediate grades by the supervisory staff of the state department, principals of training schools and teachers of science in the normal schools shows that in 6 instances or 21% the economic or vocational was emphasized for the intermediate grades when not mentioned for the primary grades, in 5 or 18% the aesthetic or appreciative, in 5 or 18% the scientific-method, in 4 or 14% the psychological, in 3 or 11% the preparatory, in 3 or 11% the knowledge, and in 1 each or 4% the observational and the ethical. This data shows that these representative administrators, supervisors,

and instructors feel that in the intermediate grades is the place to specially stress the scientific-method and the knowledge aims, and that the supervisors of the state department, the principals of the training schools, and the science teachers in the normal schools would make a strong beginning in the introduction of the economic and vocational elements into Nature-Study instruction in the intermediate grades.

In the tabulation of the distinct aims for Nature-study instruction in the grammer grades the same method was followed as for the intermediate grades, namely, those aims were listed in the instances where they had not already been recorded for either the primary or intermediate grades. The first group of teachers gave, out of a total 28 additional aims, 12 or 43% for the scientific aim, 8 or 29% for the economic or vocational, 5 or 18% for the preparatory, 2 or 7% for the ethical, and 1 or 4% for the knowledge; while the second group, out of a total 24 additional aims, gave 6 or 25% for the scientific-method, 6 or 25% for the knowledge, 5 or 21% for the preparatory, 5 or 21% for the economic or vocational, 1 or 4% for the aesthetic or appreciative, and 1 or 4% for the ethical aim. A comparative view of the aims of Nature-Study in the primary grades and the additional aims in the particular instances in the intermediate and grammar grades warrants the conclusion, namely, Nature-Study in the elementary school should be presented in harmony with the psychological laws of child development. In other words, the consensus of opinion of both groups of educators suggests an appreciation of variation in the dominant instincts and capacities and resultant interests of pupils as they continue in school and, therefore, the aim in Nature-study instruction should change correspondingly. Since one of the important purposes of this paper is to discover the effect of vocational training on Nature-Study and there is increasing value attached to the economic or vocational aim of Nature-Study in the upper grades, it may be helpful to find out, if possible, whether in the economic or vocational aim the purpose is to train pupils in the artistic, the theoretical, and the scientific aspects of many occupations,or to prepare for direct participation in an occupation. A study of manual training and domestic science courses in the schools may aid in the formation of a generalization.

In the 88 schools from which reports were received, manual training or domestic science or both subjects were much more frequently taught than Nature-Study, 33 schools present either manual training, or domestic science, or both, against 16 schools that give systematic courses in Nature-Study. The number 33 is undoubtedly too low because these courses were enumerated in responce to the inquiry as to whether or not prevocational courses were offered in the schools. It is probable that some of the city superintendents and village principals do not regard manual training or domestic science as prevocational work. In these courses in which it might be assumed that preparation for occupation should be uppermost in the minds of these adminstrators, if anywhere, only 14 out of 33 answers committed the authors unequivocally to that decision. The following quotations are typical of the remaining 19 answers:"to enable students to work with their hands," "general training rather than technical,""theoretical and artistic rather than the scientific," "only to assist in deciding what to do and to get general limits as how to get there," "furnish such knowledge as will enable the pupil to decide upon line of work to be followed," "these are not really trade courses," The thought of the supervisory staff of the department of education and the selected group of normal school instructors on the aim in prevocational courses in the grades, a cultivation of an appreciation of the theoretical, artistic, and scientific aspects of many trades or preparation for direct preparation in a trade, is set forth in these representative extracts: "In manual training the aim is to teach an intelligent use of the common tools with opportunity for the pupil to determine something of his natural aptitudes. The work should include some study of vocation," "I should say the scientific aspect, as the theory and art of a trade should go with the preparation of the trade proper;'," "It should be cultural mainly. This will be the best training for future vocational study," "Unless theory goes hand in hand with practice there is little value in it. The scientific principles can be taught most effectively by the inductive method, especially in the elementary school," "The tendency in . . . seems to prepare directly for immediate use, the apprentice idea, to be able to 'deliver goods' as soon as possible, i. e. turn the tricks of the trade. In my opinion this is wrong. Immediate

efficiency should not be gained at the price of insight and breadth;" "To prepare for direct participation in the practice and science of a trade;" "A prevocational course should give such theoretical, artistic and scientific training as is necessary to enable the pupil to see in a trade more than merely a means for earning a livelihood", "Why cram vocation down the throats of pupils all the time? A steady diet of any kind will clog the liver. Emphasize 'prevocational' if you must, but let some subjects free from it to serve as a tonic and a 'cathartic.' Only thus you can get growth." The impression left by a recital of these selected quotations, is the same as if all the replies to the question, the cultural versus immediate efficiency, were given in toto.

Evidently the majority of each of the two groups of educators believe that the function of the elementary school, even in such subjects as manual training, domestic science, or more strictly vocational subjects is not to prepare the pupil for the trade in the narrow or artisan sense, but for the larger outlook in the industrial world. Stated differently, the purpose of the elementary school is to permit the pupil to discover his aptitudes, to develop his intellect, to foster his aesthetic and ethical nature, and also, otherwise it would not be vocational at all, to give an appreciation of the industrial activities of the community; in short, the function is psychological and social, and not vocational in the narrow sense. Since these conclusions are derived from a study of the aims of vocational subjects in the grades, there should be no question as to the meaning of the economic or vocational aim, in such a subject, as Nature-Study.

As an index to the extent to which the vocational idea has been introduced into Nature-Study in the elementary schools of Wisconsin, the response to the question, "In what particular subjects in the grades, other than prevocational subjects do you make special effort to emphasize the vocational aspect?" may be noted: 17 reports mention arithmetic, 15 geography, 9 language, 4 civics, 3 agriculture, 3 reading, 2 spelling, 1 history, and 1 Nature-Study.

Although the vocational idea has hardly gotten into Nature-Study in the elementary schools of this state, the superintendents and principals are not averse to the notion. Of 45 answers to the questions of objections to giving Nature-Study a vocational trend only 4 are negative, while 41 are positive, in

favor of the innovation. However, the study of the aims of Nature-Study in the grades would suggest the introduction of this vocational idea into the work for the intermediate and grammar grades, and further, consistency demands, from the expressions on the aims of instruction in manual training, domestic science, and other vocational subjects, that this vocational trend in Nature-Study be not narrowly but liberally interpreted.

The supervisory staff of the state department, and the selected group of normal instructors have expressed themselves, by special request, quite fully on the matter of giving Nature-Study a vocational trend. Since there seems to be particular interest manifested by Nature-Study friends and teachers, in this aspect of the Nature-Study problem, it may be helpful to quote somewhat at length, first, from those who are enthusiastically in accordance with the idea, then from those who favor the notion but with reservation, and finally those that think a serious mistake would be made if Nature-Study were given a vocational trend. 1. "None whatever," "The vocational idea should not be separated from other ideas. The modern doctrine teaches that all thought tends to action. A thing is not learned until it becomes a part of the pupil's behavior." "The vocational aspect leads to what otherwise might be a decidedly abstract subject. Interest will be held. Worthwhileness so in keeping with modern trends will receive its due share of emphasis. By all means use the vocational," "A good thing for rural schools and others," "I think that this should be done. All training should lead somewhere," "I wish to be placed on the side of vocational trend in teaching Nature-Study. In fact any science should be taught with a relation to life and life's need. This need may be physical, mental, social, moral, or even spiritual". 2. "None if not too intensive with too much time from other subjects", "No objections if material does not conflict or confuse the fundamental principles of the science." "The trend may be over-emphasized with the result that one of the greatest values of Nature-Study is lost sight of. The ennobling and cultural aspects of Nature-Study are as important as the vocational and the industrial. In the primary and intermediate grades, especially, it is unwise to emphasize unduly the vocational aspect. In the grammar grades a greater emphasis can be made." "There may be cases in poor districts where vocational work needs must be pre-

sented in the eighth grade but as a rule the grade time is needed for a broad foundation. We must make citizens as well as workers." "I should be very happy to know that the young women going out as normal graduates have received the training which enables them to identify weeds, birds, flowers, trees, etc. Until this knowledge is general we can not hope for progress.

Probably the vocational aspect will further the movement greatly. I hope so. When we call it agriculture we seem to be more definite in our aims." "No objections providing the attitude and method of science can be maintained during the process. Treated rightly the vocational motive ought to constitute a tremendous leverage in holding the student to the genuinely scientific attitude of mind. Curiosity has been overworked as a motive. I doubt that a high percentage of children in the grades have a very keen and lasting curiosity in science as such. The whole trend of elementary education in . . . is to premature practical efficiency. This kills professional attitude." "At least not until the seventh grade. Up to that point lay a foundation. Otherwise I fear that the vocational trend would overshadow scientific theories. It is not until the seventh grade that the child asks 'why' and 'of what use or value.'" "The very real danger, if carried too far, of doing just what employers are apparently seeking, namely, to make class distinction in education." "This can be done only in the most general way, but is the crying need of all education, voiced in all of our public discussions, that school work should be linked more closely with the daily life problems. Further, it should train people, as a rule, for useful service where they are, rather than for some accupation which would cause an exodus from home or community. In cities where economic pressure plays a greater part in the seventh and eighth grades, pushing pupils into the industries, the problem assumes a more special form and demands more special industrial education," "too narrow; does not educate the child. We do not want a human machine, but a person bigger than his particular calling. The vocational trend should be inclusive but not exclusive." "While I think such a subject as Nature-Study should have a vocational trend some of the objections that might be raised are; it tends to stratify society, it defeats the spirit of appreciation, and it overpracticalizes education. 3. "Child has not enough

data to select a vocation. This would result in narrowness." "Leads to segregation too early on the basis of trades. Cannot give enough science to make any practical use of it. Pure science for the sake of scientific truth should be the aim of any work below the high school. This should give a taste for more science and bridge over the gap between eighth grade and high school." "The pupils will not have mastered the principles of any sciences involved sufficiently to apply them with any degree of success. Therefore, to give Nature-Study a vocational trend in the grades is to insure defeat of the ends desired." "I do not believe that prevocational training will escape being restrictive and disciplinary unless placed in charge of teachers who are wise in the principles of child nature and whose sympathies are broad;" "You put a child into a groove before he can choose a groove. He is too immature to accomplish much vocationally. You narrow him. Give him good practical work along general lines and he can get his practical training more easily later;" "It robs him of the education suited to his development. The scientific aspect gives the broad view, while the vocational trend tends to commercialize the pupil's education. It may precipitate a choice. A vocation may contribute too little to the individual and he to it if a sufficiently broad view and a thorough preparation does not precede it." In the form of a summary, of the 41 answers to the question, 13 or 32% see much good in the vocational trend in Nature-Study, 20 or 49% are careful to explain the condition under which they favor the innovation, and 8 or 29% fear that dire results might result from its introduction.

This study permits the following generalization of the present trend of Nature-Study in Wisconsin. 1. Systematic courses in Nature-Study are presented in the graded schools of the state, only in 19% of the 86 schools reporting. It is taught in an incidental manner in 24%, while there is no suggestion that any sort of instruction is attemped, systematic or incidental, in the rest, 57% of the schools reporting. 2. The most frequent objections to or difficulties in the presentation of a systematic course are over crowded curriculum and dearth of qualified teachers for the instruction. The difficulty of an overcrowed curriculum may be an implication that Nature-Study is not of sufficient relative importance when compared with the other subjects in the grades. 3. The majority of the

city superintendents and village principals, and the supervisors of the state department of education, principals of training schools and science teachers in the normal schools agree that the chief aims of Nature-Study in the primary grades are to train the powers of observation, to develop the aesthetic and appreciative capacities of pupils, and to aquaint them with the animate and inanimate material of the environment. 4. The additional aims for the intermediate grades suggest special emphasis on training in the scientific method of thinking and the extension of acquisition of information; further the educators, other than the city superintendents and village principals, think that a strong beginning should be made in the introduction of the economic elements into the instruction. 5. In the grammar grades increased importance is given to the economic or vocational aims, the knowledge, and preparatory aims. 6. The meaning of the economic or vocational aim in Nature-Study which was made the special burden of this paper, as interpreted from the aims of the more strictly vocational subjects, such as domestic science and manual training, implies a general rather than a restrictive training, an appreciation of the industries in the broad sense instead of immediate efficiency in a trade. 7. The vocational aspect is presented in arithmetic in 17 schools, in geography in 15, in language in 9, in civics in 4. in agriculture in 3, in reading in 3, in spelling in 2, in history 1, and in Nature Study 1. Even when agriculture is included with Nature-Study, the vocational in this subject is not very frequently attempted. The answers of city superintendents and village principals on objections to the vocational trend in Nature-Study shows that there is very little opposition to the notion. Consequently, the few schools that stress the vocational in this subject must be due to the relatively small number of schools that present systematic courses in Nature-Study. 8. The replies to the specific question as to whether in prevocational subjects the chief thing sought is to train in the scientific, theoretical, and artistic aspects of many trades or for direct participation in a trade, suggest that the majority believe that the purpose is to present the large outlook of industrial life, instead of specialized training in a trade. This agrees with the purposes of the prevocational subjects, manual training and domestic science. If this is the conception of industrial or vocational education, educa-

tion by means of the materials of the industries, then Nature-Study is well adapted to this end. 9. Finally, the views of the supervisors of the state department, principals of training schools, and science teachers in normal schools on the vocational trend in Nature-Study fall into three groups; first, those that think that without the vocational in Nature-Study there will be an inflation of a hazy education that leaves its victim helpless in the air while with the vocational there will be a conscious appreciation of the purposes of Nature-Study in the grades that tends to dispel abstractness; second, those that feel that the crying need of all education is to link it with the life problem growing out of the immediate environment but that the highest purpose of Nature-Study in the grades, namely, the cultivation of the highest appreciation of nature and nature's ways, may be defeated, if the subject is over practicalized; and last, those that fear that the introduction of the vocational into the subject would result in narrowness, the choosing of a groove for a pupil before he is ready for a groove, the premature forcing of pupils into the trades, and the robbing of the pupil of the education which is the best suited to his mental development.

Of these three conceptions of the vocational trend in Nature-Study the second has the largest number of supporters.

Nature-Study and the Common Forms of Animal Life.—V.

DR. R. W. SHUFELDT.

Naturalists consider butterflies and moths to be just as much within the realm of animal life as bats and beavers; indeed, zoölogically speaking, any living form in nature, not belonging to the Vegetable Kingdom, is considered to be an animal. Many erroneously believe that the word applies only to some creature of the mammalian order, which is, as I say, entirely incorrect.

Biologically, frogs, fish, and all feathered forms—that is, birds—are reckoned as animals, though it may seem strange to some to so designate them.

Speaking of butterflies and moths, it is hard to conceive of a more fascinating and delightful line of study—including field work—than these most beautiful and often gorgeous insects offer us. They have everything to recommend them; they oc-

cur, outside of the polar zones, in nearly all parts of the world; the number of species and subspecies is practically limitless; their chase and capture calls for the most active kind of exercise in the open air; the literature about them is enormous, and students devoted to their collection and study are to be met with almost wherever one travels; their study may be difficult or easy, just as the student may elect; but little pain is inflicted in collecting them, and wounded ones are very rarely left to suffer in the field. Finally, a collection of butterflies or moths, when scientifically prepared and displayed, is one of the most attractive and handsome exhibits the naturalist contributes toward man's enlightenment and culture.

Entomology—or the science of insects— is a field of enormous extent, and no single man, had he a thousand lives to live, could begin to master even what the single group of scale-winged insects—the *Lepidoptera*, which contains the butterflies and moths—has to offer for study. When I say this, I mean the *Lepidoptera* of the world. What an infinitesimal amount, then, even of what we have mastered about these insects, can be imparted in the few pages of this brief article! My object will have been attained if I can characterize one or two each of our most common butterflies and moths in such a way that the nature student, who studies the pictures I present here and masters what I say in regard to them, will ever afterwards know those particular species, in whatever manner they be presented to him.

To accomplish this, I rely far more upon my photographs of the living insects than upon my descriptions; for I firmly believe that an absolutely correct figure of an animal of any kind is far more likely to be of value to the young naturalist, in the matter of identification, than a dozen pages of descriptive matter.

This value is greatly enhanced when the illustrations are colored; but unfortunately we cannot have that advantage in the present instance, although I have colored not a few photographs from life of butterflies and moths. Within the last few years, comparatively speaking, students in this line of study have fortunately been given two magnificent handbooks on the subject, by the aid of which almost any moth or butterfly in this country, north of Mexico, may be readily identified, the identification being made the more certain by the use of the superb colored plates illustrating the volumes. I refer to the "Butter-

fly Book" and the "Moth Book" by Dr. W. J. Holland—manuals of inestimable value in this department of science, and, as

FIG. 13. The Silver-spotted Skipper, resting upon a spike of the common plantain.

popular treatises on our *Lepidoptera*, without equal in the world anywhere.

We have a very beautiful little butterfly in the species known as the Silver-spotted Skipper (*Epargyreus tityrus*), which has a wide range extending over nearly all parts of the United States —indeed it is found as far south as the Canal Zone. Last summer I captured several specimens of this species for study, selecting a fine male for photography (Fig. 13). It was over an hour before I could get him to alight precisely where I wanted him, and that was on one of the plantain spikes, where I eventually got him, exactly life size, as shown in the cut. The common plantain (*Plantago major*) needs no description, as it is a weed only too abundant in unkempt grass-plots and yards.

The body and wings of the Silver-spotted Skipper are of a rich snuff-brown, the former being more or less covered with a feathery down, which, in increased thickness, is carried along the inner borders of the inferior wings, to extend behind as a shortish tail. At the middle of the upper surface, and at the same place below, on the superior wings, there is an irregular spot of pale sienna; the silvery-white spot is on the under side of the inferior wings, near the middle. When at rest, this fine little butterfly often holds its inferior wings more or less horizontally, while the upper pair are nearly erect. Either antenna is clubbed at its extremity and tapers to an acute point, which latter is bent back into a hook. The head is large, and the eyes comparatively far apart.

We often see this beautiful little butterfly in the pathways across open meadows or through the pastures and woods; there may even be several of them together. After you once know its name, you will never forget the little Silver-spotted Skipper, for, as Doctor Holland says: "The broad, irregular silver spot on the under side of the hind wings distinguishes it at a glance from all other related species in our fauna." The Skipper belongs to the family *Hesperiidae*, and the one here described is a true hesperid of the subfamily *Hesperiinae*.

If one desires to know the typical butterflies, however, the group that contains them is the genus *Papilio* of Linnæus; there we have classified the truly elegant Swallow-tails, of which we have quite an assemblage in this county. They are called Swallow-tails for the reason that their hind wings are generally produced posteriorly into a more or less conspicuous prolongation, which, to some minds, has suggested the "tail" of the com-

mon barn swallow. There are over five hundred distinct forms of these Swallow-tails; but in the eastern states no single species is better known than the elegant yellow and black "Turnus" or Tiger Swallow-tail of the Carolinian fauna. A fine example of one of these is here reproduced from a photograph of mine

FIG. 14. The Tiger Swallow-tail Butterfly, resting on a flower of the Day Lily.

in Figure 14. This splendid creature ranges through the low-lands and forested areas of the Appalachian region, occurring abundantly through the Carolinas, the Virginias, southwestern Pennsylvania, and, to some extent, in Kentucky and Tennessee.

Sometimes one meets with it in numbers, either in the open or hovering over wet places in roadways passing through

woods. They may congregate to the number of thirty or forty specimens, offering a sight of unusual beauty, which it is quite worthy of a long tramp to see.

The flight of this gaudy insect is much varied. We often observe it quietly resting upon tall, showy flowers in the open fields, while upon other occasions it comes with a dashing, bold movement through the woods—now near the very tree-tops, now low down, near the ground, darting hither and thither as though enjoying the power it posessed to take in all that the country offered in the way of scenery and flowers, as well as to defy the net of the lepidopterist. The Tiger Swallow-tail is a large, yellow butterfly, with black markings and emarginations as shown in Fig 14; there are also red and blue spots on the hinder wings. With this description, and by the aid of the aforesaid Figure 14, one cannot miss a correct identification.

The female of this species is *black* for the most part, and was long regarded as a distinct species—an error finally dispelled through breeding-tests. These tests are extremely interesting and should be made by the young naturalist, in order to gain the experience and proof revealed by such researches. Up in Sitka they have a *small* yellow variety of this butterfly, and many of its relatives in the United States are creatures of great beauty; but space is not sufficient here to allow me to mention even the most prominent ones by name.

In my picture, the insect is resting upon a beautiful example of the common Day Lily (*Hemerocallis fulva*), which shows the open as well as the closed flower, both being of a tawny orange color; it is a European plant that has escaped from gardens.

As pointed out above, the moths together with the butterflies constitute the great order of the *Lepidoptera*. When any insect in this group is not a butterfly *it must be a moth*,—that is, a species or subspecies of the *Heterocera*, a suborder created to contain all the moths in the world's fauna, which is, by the way, a good many different kinds of moths.

In the main, butterflies possess *clubbed antennæ*, while the vast majority of moths do not. An *antenna* is one of the pair of appendages that project from the front of the head of an insect, springing from near the mouth-parts. In butterflies they are often slender and hair-like, and *clubbed*, as I say, at their free extermities. Sometimes the enlarged clubbed end is fine-

pointed and bent backwards, forming a little hook, such as we see in the Silver-spotted Skipper described above. Some of the

FIG. 15. An American Silk-worm moth, shortly after it has emerged from its cocoon, which latter is seen just above it.

connecting links between the butterflies and the moths, with *moth characters predominating*, possess clubbed antennæ; but we cannot discuss such points here as they would occupy al-

together too much space. To remember this fact in regard to the antennæ, however, I must tell an interesting story about *Dahlia hesperioides*,—a rare lepidopterid from the islands of Buru, of the Bismarck Archipelago. A specimen of this queer little "moth" was sent by Doctor Holland to the distinquished entomologist, Sir Geo. F. Hampton, and the latter declared that he was playing a trick upon him, in as much as the specimen showed that it was nothing more than some small moth with the head of a butterfly (a Skipper) attached to it! Sir George knows better now, for Doctor Holland has a fine *series* of that particular little insect in his private collection. These Buru specimens are small moths with clubbed antennæ, being one of the links connecting moths and butterflies.

One of our handsomest as well as largest moths is the American Silk-worm or *Polyphemus* moth. Its caterpillar is a beautiful animal of a fine shade of pale green, with silvery white lines raised on the sides of its body. I have bred the moth from these caterpillars a good many times, and I expect to do so quite frequently again. Last year—or the year before—I found an exceptionally large caterpillar of this species walking up the trunk of a big elm tree, upon the leaves of which it feeds, as it does upon the leaves of a good many different trees in country districts, parks and streets, where they grow. I took this caterpillar and placed it in a small box with a few elm and maple leaves, and in a very short time it spun its cocoon. The latter is shown in Figure 15, near the pine cone. It is empty now, for the handsome *Polyphemus* moth seen just below it emerged from it the following summer. The specimen is a female for it has the *big, feathery antennæ*, these latter being very narrow, hair-like, and scantily feathered along their outer border in the male. This renders it easy to distinguish the sexes of this New World moth. *Telea,* or the genus to which this elegant representative belongs, contains but two or three species, all of which vary considerably—a variance that has often misled entomologists with respect to the real number of species in existence. Curiously enough, we also meet with fine albino as well as melanic examples of this species—the first having but little or no color anywhere, while the latter have the upper sides of the wings nearly entirely black. It has never been my fortune to meet with either of these rarities, or you may be sure I would have published photographs of them long ago.

Another very interesting, numerous, and elegant family of moths are the Sphinxes or Hawkmoths (*Sphingidæ*), and we have many different species of them in this country. Later on, in

FIG. 16. Protective mimicry in a moth—a hawkmoth on the trunk of a birch tree.

some future instalment of this series, I must come back to this group with added material for you, as it would be a shame to pass it too lightly by. Therefore, I will but briefly point out that

the genus *Pholus*, of which there are some nineteen or more species with not a few varieties or subspecies, contains some beautiful examples of the group as a whole, but not the most highly colored ones. Indeed, in the case of *Pholus satellitia*—the Satellite Hawkmoth or Sphinx—the colors of its body and wings are not gorgeous although rich. Several years ago, I captured a suberb specimen of this species, here shown in Figure 16, as it was resting upon the side of a birch tree. The general *facies* of the insect and its peculiar coloration harmonized with the upcurled bits of bark to a fault, and a most interesting example of protective mimicry was there to be seen. This shows very well in the reproduction of my photograph; although, were the latter *colored*, it would show up still more effectively.

Educational Values of Children's Gardens*

Alice J. Patterson.

Those of us who have been in close touch with the Nature-Study movement for the last ten or twelve years realize that gardening has in many localities made a stronger appeal both to school authorities and to the masses of the people than some of the work along other lines. No doubt this is largely due to its industrial and economic value. That children's gardens have economic value can not be questioned. There is sufficient data to show that here and there, all over this country and Canada hundreds of children are not only receiving industrial training that, in many cases, may be of use in earning a livelihood later in life, but that now they are engaged in a healthful, pleasureful occupation in which they are independent producers, adding something to the output of wealth in their home communities. While we probably agree that the commercial value alone may make the promotion of children's gardens worth while, nevertheless, we believe that the work has educational values that are of no small importance. In this discussion I wish to give the term educational its broadest interpretation, that is, to mean the growth and development of children along all lines, physically, ethically, and socially, aesthetically, as well as intellectually.

*Paper presented at the Annnal Meeting of the American Nature-Study Society.

One of the chief educational values of gardening is that it gives children the opportunity to use hands and minds together in acquiring knowledge. The more I see of children in school and out, at their work and at their play, the more I am convinced that muscular activity plays a tremendously large part in the getting of an education.

Gardening means something more than mere spading and hoeing, planting and harvesting. With these activities come questions and problems which under the direction of a skilful teacher are solved by investigation, experimentation, and demonstration. Thus the children are discovering truth for themselves; they are acquiring at first hand sense precepts upon which to base judgment and action. They are relying upon their own efforts for many of the facts that they gain. Better than this they are developing power to see accurately, to think clearly and independently; in short, they are acquiring the first requisites of a scientific attitude of mind toward problems of daily life. A boy who sets himself a task that requires effort, care, and attention for a period of weeks or months before results are obtained is receiving a training in patience, in persistence, in suspended judgment, and in habits of industry that few other school subjects are capable of giving him.

Again, through garden experiences children are coming into a realization of nature's inexorable laws. Slowly, perhaps almost unconsciously, the truth is born in upon them that they must work with nature not against her if they are to win.

Along with the training, children through wisely directed gardening come into possession of a large fund of useful information and of scientific facts that will be invaluable to them whether they continue their education in the high school, or whether fate decrees that they must early take their place with those who earn their daily bread. In fact, the garden may be made the setting for a large number of fundamental facts that children should know before they leave the elementary school.

Indeed, I am beginning to think that if we do not give them the opportunity to develop along these lines when their interest is alive and active they may never afterward be able to make the same response, or establish the same vital relation with the nature objects in their environment. The conditions necessary for germination and growth of seedlings may better be

taught in connection with seeds that are to be planted in the garden than as isolated experiments. The fact that the seeds are to be used gives a motive for the experiments that adds much to their value. The needs of garden plants opens up a natural avenue for the study of soils, soil water, air and related topics.

The very fact that seeds are gathered for future use introduces the children to simple principles of selection in plant breeding.

All the different parts of plants used for propagation with the different methods employed can be taught with better results in connection with gardening than in any other way. Again, the garden gives a most excellent background for the study of weeds, insects, birds, fungi, and the artistic arrangement of colors.

The ethical and social values of gardening are quite as apparent as the training and the acquisition of knowledge: the school garden in which groups of children work together has its special socializing value. Such a garden, except in the large cities, should function chiefly as a laboratory in which by demonstration and experiment the principles of gardening are taught, and are then carried over into the home gardens. The class garden offers an excellent opportunity for team work. It is a community venture not an individual one. Together the small gardeners make their plans and together they carry them out. I recall a group of sixth grade children who, last spring, were setting out two long beds of salvia—two lads were measuring and stretching the line for the rows; two others with rulers marked the exact spots where the plants were to be placed; others with trowels dug the holes; while still others removed the plants from the flats and set them out. If you could have seen those children working together industriously, each doing his share, you would, I think, have felt that they were getting a training in coöperation that will be invaluable later in life when they are called upon to work with their fellows in some community enterprise.

It is, however, the individual garden, which, whenever possible, should be at home, that, I believe, gives the most far reaching ethical and social results. Here the children have a greater opportunity to exercise freedom and initiative. Here they experience the sense of ownership, and ownership develops responsibility. With these comes the joy of achievement, ach-

ievement that is the result of carefully planned, purposeful work. The very fact that a child finds himself a producer, providing something of value for the family or the community develops a self respect and a self-reliance that is a great asset in the character of any citizen of a democracy.

At the same time the work tends to generate respect for the property rights of others. Psychologists agree, I believe, that the desire to own, to keep is normal to children. When a boy has property of his own he, for the first time, appreciates the desirability of protecting the property of his fellows. Again, parodoxical as it may seem, ownership tends toward unselfishness and altruism. Any one who is in close touch with this work has almost daily proof that children take a keen delight in aiding their comrades, in giving away products to their friends, in providing vegetables for the family table or in making the home attractive with their flowers.

Closely allied to the growth that comes from personal ownership is the training in civic pride and responsibility. This is not something that we hope may follow in the wake of children's gardens; we have ample illustrations to show that in many places it is already an important part of the work.

Cleaning up back yards and alleys, improving home grounds go hand on hand with gardening. Gardening means neatness, orderliness, and these cannot have their highest expression with unsanitary piles of rubbish and unsightly nooks and corners in the vicinity. So it comes about that wherever there are children's gardens the rubbish disappears, the unsightly objects are removed or are transformed into something beautiful by the use of vines and tall annuals. More than this in many towns the young gardeners look beyond their own premises to the streets, parks, and other public property and lend a hand toward making these more attractive. As an illustration, I may mention the work undertaken by the Garden Club of the seventh and eighth grade in a small village. After the gardens were harvested this fall it was suggested to the children that they enlarge their field of endeavor. They took the initiative in the matter and appointed commitees to look around for the purpose of discovering whether there was anything that they could do to help in improving the appearance of the town. Among other things they have undertaken to keep the entrance to the school grounds

free from scraps of paper and other debris. The value of this lies not alone in the fact these youthful citizens have accomplished the bit of civic work that they set out to do, but through it they are establishing habits of care and thoughtfulness with reference to the public property; they are developing the right sort of civic pride and responsibility that ought to mean something worthwhile when they become voting citizens a few years hence.

There is another value that I think may come with gardening as well as with other phases of nature study, and that is the aesthetic. This is not so apparent in the lives of children as the other values we have discussed. But those who work with children, occasionally catch encouraging glimpses of it. We can measure the bushels of potatoes that a boy raises in his garden. We can count the money that a child receives for his radishes or onions. We can see an orderly garden or a clean, vine-bedecked alley but there is no way to measure or to make visible the subtle influence that may come to the soul of a child in this intimate contact with plant life. We do not know how much inspiration he gets from this creative exercise that may induce him always to put forth effort for human good. We can not tell to what extent the colors of his flowers, the artistic arrangement of shrubs, vines and trees may deepen into a permanent appreciation for beauty in fields, woods and roadsides, as well as in home surroundings.

We can not tell, yet we believe, that along with the other values some of the children as they spade and hoe, as they plant and harvest will sow other seeds that will develop into an abiding interest in the out-of doors, a calm appreciation for the beauty of the landscape.

A Grasshopper's Early Life

Walter K. Putney.

Quite often, if you are to look for them, you will find grasshoppers resting for long periods on the ground and you wonder what they are doing. They seem to be partly buried in the ground. These are the females laying their eggs in little holes in the ground—a very curious place, you may think, for a young grasshopper to commence his life struggle.

A butterfly, when it is hatched comes out in the larval or caterpillar form, crawls around, a general nuisance, eats rather slowly and yet greedily, outgrows itself and seeks rest in the little cocoon that it spins, from which it will emerge an adult. The grasshopper does nothing like this. To be sure, it eats voraciously and grows rapidly; it is just as much of a nuisance, but we do not think of it as such inasmuch as it does not get quite as neighborly as the caterpillar and stays away from house and building unless it has been hatched among leaves of shade trees. But as it grows it sheds its skin; the next covering is not quite as tight and there is room for expansion. This goes on for perhaps four or five times when behold, the adult grasshopper appears! The young are very, very numerous, sometimes covering the vegetation like a carpet; they are wingless and crawl around only within a limited area, as compared to the ever moving caterpillar. But as you look at them you see after each moulting the traces of the wings that are to come forth at the final moulting. Then when the last step is taken how good that chap does feel to think that he can fly and jump around like his father!

Were it not for the fact that the grasshopper is such a nuisance, we would call him one of the most interesting of our little-creature neighbors. We might even term him a friend and watch his development with intense interest; but, unfortunately, the grasshopper, and especially the locust that migrates from place to place, is a pest and we do the best we can to exterminate him. Instead of encouraging, we discourage his stay with us. About the only good I ever knew a grasshopper to be, was as food for turkeys. The old farmer will tell you that the best turkeys he ever raised fed upon grasshoppers which were exceptionally abundant those years.

THE BLACK SWALLOW-TAIL

One of the most interesting of our butterflies is the black swallow-tail which is best seen in September. Let us go back a little, before we study the butterfly itself, and see what the caterpillar looks like. This fellow is a "saddle-back"; that is, he has a white saddle in the middle of his back and this peculiar coloring helps to protect the caterpillar, for in this way it assumes the color variations of the twigs upon which it feeds.

Later, as the moulting processes go on the white saddle is lost and it develops a new kind of protection by means of scent organs situated at the end of the body. You will not see these scent organs until the caterpillar is alarmed. Then a little sheath opens, an orange colored Y-shaped organ is protruded and there comes to your nostrils an odor that is exceedingly disagreeable. Then when the danger has passed, the scent organ is withdrawn into the sheath again.

The swallow-tail butterfly always lays her eggs on some member of the parsley family. She never makes a mistake, strange as it

Black Swallowtail Butterfly.
Photo by Author. Book rights reserved.

may seem. This is something that cannot be said of many butterflies and where the swallow-tail gets the knowledge of botany nobody knows. But you may safely conclude, if you find her eggs, that the plant they *are* on is a member of that family.

It is very interesting to watch a caterpiller feeding on a leaf of wild parsley, for it is so very methodical in its manner of eating. Not a particle is wasted and there is no wasted effort, either. Up one side and down the other he goes taking off each division of the leaf down to the central rib. There is never a false cutting by the little mandibles, and no parts fall to the ground. The caterpillars never seem to seek concealment as they always eat and rest on the upper side of the leaf, except dur-

ing the heat of the day when they go down on the stem in the shade of the plant "umbrella." The birds do not care for them as that scent organ is enough to drive all desire to eat them away on first acquaintance with it. But there is a reason why these little creatures are not more pestiferous than they are. One might naturally think that with the freedom that comes from being let alone, the caterpillars would soon overun a place; that would be the result if it were not for the ichneumon fly. This latter creature seeks the caterpillars of the black swallow-tail and in their bodies lay eggs. This is no inconvenience to the caterpillar in its present stage for no harm is done to any of the vital organs and the caterpillar does not realize that it is carrying around a parasite. But when the cocoon is made the eggs hatch into minute grubs that feed upon the bodies of the caterpillars and instead of a beautiful butterfly coming from the cocoon we find the ichneumon! Scientists speak of such a process as "bewitching" of the caterpillar, for surely it does look as if some old witch had transformed the beautiful swallow-tail into a homely fly as a punishment for some misdeed. Out of a hundred chrysalides it is doubtful if more than ten or fifteen percent produce the butterflies.

When, however, a swallow-tail does appear, what a beauty he is! The wings are black and are crossed by two rows of yellow spots and with little marginal lines (or linules) of yellow. On the hind wings between the two rows of yellow spots there are scattered blue scales which are very attractive in color.

Then near the inner back angle of the hind wing is an orange spot with a black center that adds much to the beauty of the butterfly. This spot is supposed to be a scent spot, protecting the butterfly from attack, just as the Y-shaped organ protects the caterpillar. Authorities, however, differ on this, some claiming that the scent is not at all noticeable and that the notion that it was a scent spot originated from the idea of associating the color, orange, with the color of the scent organ of the caterpillar. The female is much like the male except that the second row of yellow wing spots is less conspicuous and the blue more marked.

THE DEATH-HEAD MOTH

Mother Nature has marked many of her children curiously. Perhaps we might say that she has given to each an appropriate coat to wear. How would you like to wear a coat that had a marking like this in the middle of your back. This photograph is of the death-head moth, an insect about as curiously marked as any that we can find on earth. There are a great many odd moths and butterflies; you may find the snake very plainly drawn in the shape and markings of one of the tropical moths; you will see the eyes of the owl staring at you from a beautiful butterfly; you may find, although you will have to hunt

Death-head Moth.
Photo by Author. Book rights reserved.

very carefully and with your eyes wide open, the butterflies that imitate a leaf; but this death-head moth is about as odd as I ever saw.

As you look at the back, between the wings, you will see the eyes very prominent and the lower part of the face hidden as if with a mask. It looks like a skull and for that reason we get the name "death-head" moth. Some species are better marked than this one, and many have the nose and mouth cavities fairly well outlined. There are a few that have a facial resemblance to a monkey.

Outside of the gruesome markings this moth is very attractive and the "fuzz" of both body and wings is very velvety in-

deed. The color is a rich brown for a background with steel-blue, black, and white markings. Whether or not this particular marking is for protection, one cannot say, but probably it is because Mother Nature never yet gave an insect or bird any extravagant colors or lines that were useless. Even among our most gaudy creatures we find a certain amount of protection in the play of light and shade, and perhaps with this moth such is the case.

Hyacinth, Asparagus Sprengeri and Narcissus.
Fifth Grade, Bartlett Training School.

Successful School Room Gardening

CLARENCE M. WEED,
State Normal School, Lowell, Mass.

For several years I have been trying to solve the problem of school-room gardening for individual pupils under conditions obtaining in city and rural schools in our Northern states. We have reached a point where we can have each child take care of several plants through the school year under ordinary school conditions and with practically no interference with other school work.

According to this plan shelves are placed along the wall beneath the windows. These shelves are usually seven or eight inches wide and as long as the windows are wide. On these shelves are placed zinc trays as wide as the shelves with sides about an inch high. We usually have two trays to a window.

Paper Flower-pot with Crocus.

On these trays are placed paper flower pots in which the pupils grow various foliage and flowering plants, seedlings of various sorts, tree cuttings and a great variety of spring flowering bulbs.

In a room with forty children and three wide windows it is easily practicable for each pupil to be provided with three plants at all times. The front side of the trays are divided off into spaces by chalk lines, each space being numbered consecutively

from one to forty. Each pupil is given one of these numbers and assigned the corresponding space. It then becomes a comparatively simple matter to conduct the gardening operations and to have each pupil care for his own plants from beginning to end.

Next to the shallow zinc trays the most important item in this program is the paper flower pot. It is a constant source of wonder to me that so few Nature-Study teachers and supervisors have realized how essential these pots are to successful school room gardening by individual pupils and I am convinced that this individual care and responsibility is about the only kind of school room gardening that is worth while in our large city schools. These paper pots have the advantage that the evaporation takes place chiefly from the surface of the soil rather than the sides of the pot as is the case with the ordinary pottery flower pots. On this account one can grow plants in three inch paper pots in the school room where it would be out of the question to do so in pottery pots of the same size. The paper pots also have the additional advantage that the sides can be pressed in where crowding is necessary, so that more of them can be used on the trays than would be possible with the pottery makes. There are two kinds of these pots now on sale and they can be ordered through the larger seed houses. One is the Neponset paper pot the other is the Peirce paper pot. I have used both and have found them satisfactory.

The best foliage plants for such school room use are Asparagus Plumosus, Asparagus Sprengeri and Tradescantia. There are also many small ferns which can be used successfully. Among the flowering plants the geranium is of course the most satisfactory. The spring flowering bulbs, however, furnish the most desirable plants for this individual gardening and should be largely grown in all schools. We have found that the Paper White Narcissus and the French Roman Hyacinth will blossom successfully if kept in the school room from the first, while most of the other forms require a period of root development in a cool basement.

The accompanying picture shows the methods and some results as they have been obtained under ordinary city condition in the Bartlett Training School at Lowell. In the first grade low, zinc-lined tables were substituted for the window trays, so that the children could more easily care for the plants. The results have been especially gratifying in these rooms.

News and Notes

Mr. R. W. Guss took the position of school Garden Supervisor in Cincinnati, Feb. 1.

A CORRECTION—In Miss Barret's article on the Most Useful House Plant, in the January Number, p. 19 about middle of the page, "But unfortunately flour contains a ferment" etc., should read "But fortunately," etc. The error was the editors not the author's.

The Committee on Course of Study for the United States Indian Schools recently convened by the commissioner of Indian Affairs, Cato Sells, after several weeks' work in conference at Washington has completed a course of study which will give to the Indians the best vocational training offered by any school system in the United States.

As these schools must train Indian youth of both sexes to assume the duties and responsibilities of self-support and citizenship, this course strongly emphasizes vocational training.

It is divided into three divisions. The first is the begining stage the second the finding stage, and the third the finishing stage.

During the first and second periods the training in domestic and industrial activities centers around the conditions essential to the improvement and proper maintenance of the home and farm. The course outlined in the prevocational division is unique in the fact that in addition to the regular academic subjects boys are required to take practical courses in farming, gardening, dairying, farm carpentry, farm blacksmithing, farm engineering, farm masonry, farm painting and shoe and harness repairing, and all girls are required to take courses in home cooking, sewing, laundering, nursing, poultry and kitchen gardening.

This course not only prepares the Indian youth for industrial efficiency but at the same time helps them to find those activities for which they are best adapted and to which they should apply themselves definitely during the vocational period, the character and amount of academic work being determined by its relative value and importance as a means of solving the problems of the farmer, mechanic and housewife.

Non-essentials are eliminated. One-half of each day is given to industrial training and the other half to academic studies. All effort is directed towards training Indian boys and girls

for efficient and useful lives under the conditions which they must meet after leaving school. Other objects to which this course directs special attention are health, motherhood and child welfare, civics, community meetings and extension work.

AN INTERESTING NATURE NOTE—In the fall of 1914 I secured a chameleon from a local dealer and placed it in a cage in the laboratory. It was to be used in connection with the lessons on cold-blooded vertebrates. About a week later the animal, which had been a center of attraction because of his beautiful coloring and quick changes of color, escaped.

In connection with our laboratory there is a small plant room, one use of which is to serve as a storage place for plants that have been attacked by insect parasites. These plants we have customarily treated with the usual sprays of poison, etc. English Ivy growing in the plant room had to be treated not less than once a week to keep the ever-increasing Aphids within bounds.

Owing to a press of work about the time the pet chameleon escaped the plant room was neglected for a time. To our surprise, we found later that the insect parasites were not showing their wonted capacity for multiplying when no insecticides were used. At the time we were at a loss to account for this. One day about six weeks after the escape of the chameleon he was seen on a fern by one of the teachers and we then knew why our ininsect pests were on the decline. The chameleon was seen only four times in ten months, but during that entire time none of our usual precautions against insect parasites were taken.

Meanwhile our little ally kept in good condition and proved himself more than equal to the occasion, going up on shelves eight feet above the floor in his active hunts. During the summer vacation he disappeared for good.

This year we have obtained from the Zoological Park another chameleon to continue the effective warfare of his predecessor. The results are more thorough than our efforts could bring, and the time saved amounts to a good deal.—CHESTER A. MATHEWSON.

Book Reviews

ECONOMIC ZOOLOGY. By Vernon L. Kellog and Rennie W. Doane. Pp.x + 532 Henry Holt & Company, $1.50

PRINCIPLES OF ECONOMIC ZOOLOGY. By L. S. Daugherty and M. C. Daugherty. Pp. vii + 410. W. B. Saunders Co. $2.00

It is interesting to find books appearing now from the presses of the publishing houses on the economic phase of zoology. These two are good samples of the type. They are both intended for secondary school work, and apparently indicate a changing point of view in high school instruction in zoology. The Daugherty text takes up the subject matter on the basis of classification, as has been quite usual in the zoology books, but it gives considerable attention to the economic phases of the subject. The Kellogg and Doane text takes up the study of the frog and of the grasshopper as introductory to the study of animal life, then follows the customary order of treatment from the lower to the higher animals. But it devotes Part ii consisting of 167 pages, to economic zoology, and entomology, the major part of it to the latter phase.

A careful analysis of these two texts shows that 7.7% of the Daugherty book is distinctively economic, and 43.9% of the Kellogg and Doane text.

THE FIRST PRINCIPLES OF HEREDITY. S.Herbert. Pp. viii + 199. The Macmillan Co. $1.75.

This book was written "to supply in a simple and yet scientific manner all that may be desirable for the average intelligence to know about heredity and related questions, without at the same time assuming any previous knowledge of the subject on the readers part." It is the result of a course of lectures given by the author to a class of working men and others and was prepared because no book containing a simple but adequate account of the present status of the subject could be found. The following list of the chapter headings will give a good idea of the contents: i, Introduction; ii, Reproduction; iii, The germ-cells; iv, and v, Theories of Heredity; vi, The Inheritance of Acquired Characters; vii, The Inheritance of Disease; viii, Mendelism; ix, Biometrics; x, Conclusions. There is a short literature list and a valuable glossary. The topics considered are well done and should be of vital interest to every one.

The difficulty encountered in the production of such a book is that of keeping it up to date since no other biological subject is advancing with such rapidity as is the study of heredity. It is to be hoped that a revised edition of this excellent book will be prepared. R. W. H.

First Principles of Heredity, By S. Herbert. Pp. xiv+346. The Macmillan Company for A & C Block,London $2.00

Dynamic Evolution, By Casper L. Redfield. Pp. xi + 210. G. P. Putnam's Sons. $1.50

Heredity and Environment. By Edwin G. Conklin. Pp. xiv + 533. Princeton University Press. $2.00

The Mechanism of Mendelian Heredity. By T. H. Morgan, A. H. Sturtevant, H. J. Muller, and C. B. Bridges. Pp. xiii + 262. Henry Holt & Company. $3.00.

The titles of these books seem quite diverse, and yet all are treating the subject of evolution and some of the problems that are fundamental to it. The First Principles of Heredity presents the outline of cosmic evolution briefly, then takes up the evolution of the earth, but devotes the major part of its subject matter to the discussion of the evolution of life. The earlier chapters on the evidence from morphology, embryology, geographical distribution, Lamarckism and Darwinism, are very similar to those of Romanes. The book will be much appreciated, however, for its clear presentation of neo-Lamarckism, orthogenesis, and its discussion of mental and moral evolution. The latter part of the book deals with the evolution of Society. It is evident, then that the book is quite comprehensive. A valuable part of it is the citation of literature in connection with each chapter. The author is apparently reasonably familiar with the modern literature of the subject, and refers to much of the valuable work that is under way both in England and on the continent. He does not seem to be impressed with the work on experimental evolution that is being done in this country. One would expect to find reference to such work as that of Morgan, Tower, Shull, Mac Dougal, and others, but no references are made to their investigations.

Dynamic Evolution, by Redfield, is an attempt to show that the energy developed in organs through functioning is cumulative and is transmitted to succeeding generations. The author says that speed in the case of the trotter, is improved by training

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VOL. 12 APRIL, 1916 No. 4

Taking Nature-Study to the Teacher

CHAS. W. FINLEY

Probably more than half the teachers in our graded schools have never had a course in nature-study as part preparation for their work. That there is a demand by teachers for such a course has been demonstrated in the extension work of the State Normal School at Macomb, Illinois. At the end of the school year 1913–14 the school received a request from the teachers at Galesburg for the organization of a course in nature-study there as part work in the regular extension course for the following year. The request was granted and a class of thirty-three teachers was organized. Twenty-seven of these teachers completed the course and received credit at the normal school for their work.

The work as outlined consists of ten class meetings and six half-day field trips. In addition to these, each student is required to write four papers and make a usable collection of some nature-study materials.

A pamphlet outlining the course was prepared, a copy of which was given each student. Following are two of the outlined lessons as they appear in the pamphlet:

LESSON I. THE SCOPE AND FUNCTION OF NATURE-STUDY

1. Definition of nature-study.

2. Materials suitable for nature-study work; plants, animals, weather, earth materials, physical and chemical phenomena.

3. Relation of book study to nature-study.

4. Relation of nature-study to other school subjects.

5. A consideration of the educational, ethical, æsthetic, and religious values of nature-study.

6. Nature-study as a "program" subject.

7. Scientific names vs. common names of nature-study materials.

8. Methods of studying nature; informal, scientific, logical, psychological, seasonal sequence, etc.

9. The teacher's preparation for and attitude toward the work.

10. The course of study.

References: Schmucker, "The Study of Nature," pp. 17–70; Hodge, "Nature-Study and Life," pp. 1–33; Comstock, "Handbook of Nature-Study," pp. 1, 2, 4, 5, 8, 10; Comstock, "Insect Life," pp. 1–9; Holtz, "Nature-Study," pp. 3–32, 53–70, 399–402; NATURE-STUDY REVIEW, Vol. 6, No. 7, Oct., 1910.

LESSON II. NATURE-STUDY COLLECTIONS AND SCHOOL ROOM EQUIPMENT

1. Use of living specimens.

2. Insect collections.

3. Plant collections.

4. Methods of preservation and values of various preservations.

5. Home-made collecting apparatus; live cages, insect nets, killing bottles, preserving boxes, mounting boards, aquaria, bird boxes and plant driers.

6. The value of the collecting instinct of children to this phase of the work.

7. Use of various illustrative materials; actual specimens, pictures, models, diagrams, etc.

8. The nature-study museum.

References: Schmucker, "The Study of Nature," pp. 70–88; Hodge, "Nature-Study and Life," pp. 45–61, 393–404; Comstock, "Handbook of Nature-Study," pp, 380; Comstock, "Insect Life," pp. 28–32, 284–335; "Farmer's Bulletins," Nos. 586 and 606 U. S. Dept. of Agriculture.

This year the work is being given to a class of twenty-three teachers at Monmouth and three other cities in the district have asked that the work be given there.

"The Great Chip Rocks" of the Hudson

Gayne T. K. Norton

A story of war and of peace; of the world's creation, and of vast glaciers and ice flows; of birth, history and progress of a great nation; of a wonderful river and wonderful cities; of two States; of forests and lakes; of the joys of thousands; of a fight against destruction by an industry, and, at last, of a peace and beauty won through mighty efforts—this is the story the Palisades of the

The Great Chip Rocks

Hudson has to tell. It is graven upon the crags indelibly and all whose eyes are keen may read.

"The Great Chip Rocks," as the Dutch pioneers called them, extend almost due north and south for a distance of thirty miles, from Bergen Point, New Jersey, to Piermont, New York. They vary in width from two miles to less than a mile, and their altitude ranges from a maximum of 550 feet near the northern end to a minimum of a few feet near the southern end, the average elevation of the ridge being 260 feet. The eastern face is abrupt, either vertical or slightly slanting; the western face is much less steep and forms the beautiful fertile Hackensack Valley.

From a geological standpoint the bluffs are rich in meaning. Records of great processes in the formation of the earth's crust can be clearly traced. The main ridge is of igneous rock of the trappean variety, which rose through a fissure in the earth's crust in what the geologists term the Jurassic Period. This process is said to have occurred 30,000,000 years ago and is similar to that which produced the Giant's Causeway in Ireland and the Cliffs of Kawaddy, India. The present appearance of the bluffs did not result from this process alone, however. It remained for future processes to disclose the Palisades to view. The deposits which covered them were worn away by erosion, and thus the transformation which gave us the majestic cliffs began. As the igneous rock cooled before being exposed to the air it shrunk and broke off in sharp perpendicular formation; this occurred along the whole ridge. North and south along the present bed of the Hudson occurred an immense "fault" or slip in the earth's crust. This caused the Hudson to flow in a canyon which recent borings show to have been 300 feet deep. The gorge extended beyond Sandy Hook, the coast at that time being many miles southwestward of its present location.

The next transformation came with the ice fields of the glacial period. The ice moved across the cliffs obliquely from the northwest carrying with it millions of tons of rock and debris which were deposited here and there about the bluffs forming an intramorianic drift. The crunching of the ice over the flat rocks of the top ground deep grooves into the igneous rock, leaving imprints of its passage clearly discernable to-day.

With the melting of the ice the ridge was surrounded by water to the depth of 200 feet. As this sea subsided, the Hudson began filling its gorge with silt. This process is still going on—it is now necessary to dredge the river often—and the river is known as a "drowned river."

The Palisades rock is dark gray and blue-black in color, very hard and heavy. Chemically it consists of 55 per cent. silica though under a microscope it discloses myriads of crystals, the feldspars, pyroxine and magnetite predominating. The ridge has a perpendicular thickness of 1,000 feet.

Historically the Palisades are rich in associations. Of the prehistoric dwellers we have no trace. Tribes of the great Delaware nation lived there when the first white men in September, 1609,

viewed the cliffs. As the years passed solid, stone walled, heavy beamed Dutch farmhouses replaced the leathern huts, and for a century red man and white lived in peace. Across the river little New Amsterdam laid the foundation for the great New York, and then came the revolution.

Upon the Palisades many minor and several major scenes of the war were enacted. Historic old Fort Lee saw much action and many relics have been found in the neighborhood. Many times the armies scaled the bluffs and some of the old military roads are still in evidence. "Light Horse" Harry Lee with a handful of men captured the English stronghold at Block House Point. Bull's Ferry, a short distance from the Point, was an important landing place. It was before Sneden's Landing (Dobb's Ferry) that the first salute to the American flag was fired by the English navy. Above these points many engagements occurred and now countless monuments and tablets mark the spots.

Alexander Hamilton and Aaron Burr fought their famous duel in a secluded part of the bluffs, while other parts have been selected as the background for many stories; Edgar Allen Poe was particularly fond of setting his stories there.

For years after the war the bluffs remained unchanged. Then, at the southern end, blasting began as the Jersey cities grew. Much of the rock which now is a part of the buildings of New York was once part of the cliffs. The blaster has wrecked the beauty south of Edgewater, and old Indian Head is now a jagged quarry. Tunnels pierce the bluffs, and factories have finished the destruction of the southern end.

The roads, both old and new, form an interesting feature of the bluffs. They zigzag up its face, crossing and re-crossing mountain torrents with a chasm on one side and a sheer wall of rock on the other. They wind through the forests at the top of the Palisades and circle ponds and lakes giving rare and beautiful views to the traveler. The moving picture man has discovered these and the veteran bluffs are now the scene of many dramas.

The quarrying interests began work north of Edgewater but here public indignation soon stopped them. Thus began the last chapter of the story of the bluffs. A Palisade Interstate Park Commission was formed and after prodigious efforts and the expenditure of thousands of dollars, saved the bluffs from further damage.

The Commission was balked at every point. The women of both states took a hand and at last legislation was passed recognizing the Commission and granting it appropriations and concessions. Gradually the land was bought and to-day the Palisades Interstate Park, with an area of seven hundred acres and a shore line fourteen miles long, is a reality. It is easy of access, all are welcome, and no fees are charged. Improvements of every kind have been and are still being made which make the Park a matchless recreation center. Thousands of persons enjoy the beauty and comforts of Bear Mountain and the other playgrounds, while the white dots of the campers' tents are to be seen all about. Boats and bathing are free and even tent bottoms are provided for the tents.

The Home Museum as an Aspect of Nature-Study

B. Clifford Hendricks.

"Do you know what kind of moth this is, Mr. Hendricks?", was the first introduction that the writer had to the fact that Jerry Mickle had a home museum. But it was not the last time that he had occasion to know of it. Jerry is a boy but ten years old and he does his school work in the fifth grade. While he is a busy lad helping take care of the chickens, the pigs and the home garden, and not neglecting to have a good time at play, his chief pride is in his home museum. He started upon this line by falling heir to some stuffed birds which his stepfather had. The interest was given a further impetus by a visit to a small museum in the community where he was spending part of his summer's vacation.

A visit to this museum shows that it is not the result of a spasmotic effort upon his part but that it has grown consistently during the last two years or more. It contains quite a variety of articles, as the accompanying cut will show. Many of these have been sent to him by friends who know that he is stocking a museum. A horned toad came from Texas, some pebbles from the base of Bunker Hill Monument, and some shells from the Pacific coast. His collection contains, not only birds, butterflies, moths, snakes, lizzards, leaves, and flowers but has, in addition, a collection of coins, a collection of colored copies of such masterpieces as Corot's "Dance of the Nymphs,"

"Dignity and Impudence," Briton's "Song of the Lark," and others. His latest interest is in fossils. Of these he has recently made a collection from a near-by fossil bed and was quite interested when the writer told him of some fossil forms which are to be had in this community but which he did not have in his collection.

Jerry is not exclusively partial to the stuffed and preserved specimens. He was an active and interested member of the

Terry and his Museum.

"Boys, and Girls, Garden Club" during the summer just past and since outdoor gardening has become impossible he has been expressing his interest in that line of Nature-Study by growing bulbs indoors. That he has been successful in this work was evidenced by a Christmas remembrance in the form of a beautiful white narcissus, in bloom, which he saw fit to send to the writer's home. He also has a part responsibility for the care of a pair of white rabbits, a white Spitzer dog, Woodrow, and a Boston terrier, Micheal O'Halloran by name, which has come into his list of play-fellows within the last eight months.

Jerry's activities have become contagious in the community. Other boys of his age are beginning collections of their own.

Those who do not receive home encouragement in this line of activity have shown their interest in his collection by various contributions from their own hands or by accompanying him upon his nature jaunts.

After a visit to this boy's museum, and after witnessing his interest in the things which he has collected and in the things he hopes to secure, and after learning to what extent his teachers are making use of this great interest of his, the thought occurred to the writer that it might be worth while to examine it and see if it really should be encouraged. There are those who would not favor an enterprise of this sort.

It can be readily understood why some mothers would not welcome such a collection into their homes. Snakes are never an attraction in the eyes of the mothers; there is some litter to be expected from hornet's nests; leaves as imperfectly mounted as his, are always crumbling off upon the floor; and above all such a collection of things would hardly seem fit to have room in a well ordered home.

Some practical man of affairs might contend that he could see no possibility of any money value in all this dead stuff, while on the other hand it is costing good hard cash to buy formaldehyde and other preservatives. Besides if the boy is encouraged to employ his time in this form of activity will he not be more likely to become a shiftless "Ne'er Do-well" unable to take care of himself in later life?

The old type teacher who is fast disappearing, thanks to progress, would probably say that he had better be at work solving his arithmetic problems or diagramming his sentences or drawing maps for his geography lesson instead of "trapesing" about the country with a butterfly net or scraping around some fossil bed.

It is our task to meet those objections and criticisms if we believe that not only this boy but that other boys should be encouraged to pry thus into nature's affairs. In the first place, in answer to the mother, as long as the boy is employed with these specimens from the natural world he is not going to be polluted by the questionable things of his social world. No one will question but that the exercise in the open which the collection of specimens for such a museum would require, is much more to be preferred to stagnation in some barber shop or to the "sissi-

ness" of too much home coddling. Many a mother would find that putting up with the debris of such a museum is much more easily borne than the coarse habits formed by those sons that have been driven from such overnice dwellings into the street and alleys because some things that really interest boys were "too dirty to have in the house."

To the man of affairs it should be said that "man does not live by bread alone, but by every word that procedeth out of his mouth." The time has arrived when a man's life is measured not by what he gets, but by what he gives. That man gives most, who has really learned to form the habit of seeing both much and minutely. It seems reasonable to assume that he who has searched nature's nooks and crannies for all sorts of interesting and novel things, will not desist from this pleasant enterprise later in life simply because he has become a man. In most cases this work will not be a basis for his livelihood but rather an important one of those assisting factors classified in family budgets as contributing to higher life. On the other hand examples might be cited of men who have, in their boyhood days, taken an active interest in the natural world and later have turned this interest into tremenduously worth-while things for those who followed after them.

In answer to our formalistic school teacher, it is to be remembered that "the letter killeth but the spirit maketh alive." Arithmetic problems built upon an interest growing out of nature's problem, have, because of their foundation, that spirit which will make them vital to the pupil. If more of the maps in geography were made as an expression of routes and points of interest in tramps about the country instead of merely meeting some arbitrary requirement of a course of study, they would be of infinitely more value as a factor in the mental training of youth.

It is a consummation devoutly to be wished, that our teachers become broad enough to recognize and acknowledge that their contribution is but a drop in the great life bucket of training for the pupils. This would lead the teacher to put a proper evaluation upon the many things outside of the school room which are often more important in the life training of the child than those she contributes. This means that she will constantly give such things prestige in the eyes of the pupils by relating the more formal instruction of the school room to them. Such a teacher

will be alive to encourage home museums, garden clubs, care of pets, manual training projects that pupils may have under way, and a host of other such interests that might be named. In other words, may we as teachers be humble and admit that we are but incidents, helpful or otherwise, in the average child's life and above all, let us not become jealous if Jerry learns more from his museum than from us.

The Burroughs Nature Club

ELLEN M. PHILLIPS

When these fine warm days arrive, even people who live in the city begin to hear the call of the open; and fortunate indeed are those who may answer the call at once. Fortunate, too, are those who, though not answering at once, look forward to a time when for at least a week or two they may forget the din and bustle of city life and spend their time in the great out-of-doors. But what of those less fortunate to whom the call is none the less clear, nay, to whom it sounds most loudly and insistently, who must turn their backs upon it and day after day must face the noise and confusion of crowded streets, the tumult of busy factories, the heat of stuffy tenements? What of their children? If anyone doubts the fact that these children long for the fresh green of which they have been robbed, let him load his car with wild-flowers, take them to a school in a congested portion of the city, and watch the faces of the children as the flowers are distributed. He will surely behold the "light that never was on land or sea."

For years the teachers who love Nature themselves and who are able to go out into her by-ways occasionally for rest and re-creation to their own spirits, have longed to open up her secrets to the little ones of the city who are in and of the "madding crowd."

They have succeeded in bringing into the class-room much nature material. The good work began years ago when a little school up in Dutchess County, consisting of sixteen pupils and a noble woman with all nature personified in her heart, kept busy and happy providing nature material for a school of 2000 children down among the tenements of the East Side.

These country boys and girls went for nature tramps with their teacher and brought the trophies of wood and field back to

the little school-house where they were packed and forwarded to their city cousins. Evergreens, labeled and classified; deserted birds' wasps' and hornets' nests; twigs, berries, and, in the springtime the early flowers—all Nature's gifts were as far as possible sent to these children of the East Side of N. Y. City who were hungering for them.

From these small beginnings there sprang up a live interest in Nature-Study in this school. It soon came in touch with the National Plant, Fruit and Flower Guild, the science committee of the Normal College Alumnae Association, and various private and public schools in suburban districts, as well as with social societies and individuals who realized that the love of nature is in every child's heart, and that in our crowded cities it needs nurturing.

Last spring barrels of daisies were sent by the children in the schools of New Rochelle. Every one of the 2500 girls received a bunch of daisies. The barrels were unpacked in front of the children, each class in turn coming forward to receive its daisies. When the children had received the flowers they were asked to sing a daisy song and wave the bunch of flowers.

This little human meadow with the waving flowers gave the children some idea of how a field of daisies appeared "dancing in the sunlight."

While teaching in schools of a congested section of a big city, the teacher nature-lovers cast about for a way of bringing to their children not only this nature material but also such an intimate knowledge of it as would cause the child in later life to go and seek Nature for himself. They found the Burroughs Nature Club. It had been organized by Mr. Albert Pratt. The plan was simple; a series of one hundred questions was arranged in groups of ten, the answers to all of which were to be found in the the fifteen volumes of John Burroughs' works. When an answer had been found and illustrated by all the live materials the teacher could secure, the children were led to write their answers, thus giving opportunity for self-expression along lines heretofore unknown to East Side city children. They knew little of John Burroughs then, yet such was the interest created by the first ten questions that within a month they were eagerly reading "Signs and Seasons," "Winter Sunshine," "Birds and Poets," "Fresh Fields," etc. and the interest has never died. Teachers

soon discovered that, though it was impossible to teach the children at first-hand in the woods, these books, with the aid of actual material brought into the class-room, made things almost as vivid, and in addition the children learned to describe what they saw. In other words, by rubbing Aladdin's lamp of imagination they could be transported from their sordid surroundings to fresh fields and the genie, under the name of John Burroughs, would go with them and give his very own word to help them describe the vision.

This by-product of expression soon assumed an importance equal to the nature knowledge, for it became apparent that the spoken and written language of these children, mostly foreign born, was improving because of their close study of the clear, simple language of John Burroughs. Soon his phrases were incorporated in their vocabularies. For example, a 4B girl, 13 years old and foreign born, upon seeing a picture of a lonely Adirondack Lake, exclaimed: "Oh, that just shows the wildness and solitariness of nature." The previous month her class had answered the question: "How does the loon represent the wildness and solitariness of nature?," and this is what she had written:

A Lonely Bird of the Northern Lakes.

"Come and travel with me to the great northern solitary lakes. There you may feast your eyes. Look how she flies in the air! Listen a moment! Do you hear her scream? Does it sound like the robin or the blue-jay? No! Do you see her now? I don't. She swooped down into the water. Mother Nature has put her just where she belongs. Her weird and doleful cry awakens the echoes. She is also full of wildness and solitariness. Can you guess her name? She is called the loon.

"She has great fiery eyes gleaming from her jet-black head; they are full of meaning. She has a white breast. Her legs are in back and her wings are in front; she has the fur of an animal and the feathers of a bird, and the heart of both. She builds her nest of grass and reeds along the margin of a lake.

"Her food consists of lizards, fishes, and water insects. When she catches a fish, she swoops under the water and there she eats it.

"In winter she travels south; in summer she breeds in the north. She travels so far and is never tired. I am going to tell you what Mr. Bryant has said about a bird like this.

'All day thy wings have fanned,
At that far height, the cold, thin atmosphere
Yet stoop not, weary, to the welcome land,
Though the dark night is near.'"

ANNIE SCHOENFELD, 4B1
Oct. 22, 1914.

(This girl was thirteen years old and had been a year and a half in America when she wrote this composition.)

Here is another composition.

"A SPRINGTIME MESSAGE OF THE WOODS.

'Those who praise themselves the most
Oft deserve the least, I think;
Truly great birds never boast
Of their greatness, bobolink.'

"I think it is a very pleasant thing to go through the woods on an April day. If you cannot have this opporunity, you may read this little message that I bring to you.

"In the springtime you see the buds bursting forth, and the air feels balmy; the stimulating odors are indescribable and the sounds are most refreshing to the ear. The grass is green and the ground is soft and brown. As you walk, you hear the piping of the frogs among the marshes, the barking of the dog, the lowing of the cow, and the morning song of the lark, robin, and, best of all, the bobolink and the mocking bird of which I am about to tell you.

"There is one we love who is very similar to the bird and that is the poet. His songs come from his heart, and, when he builds a home in which to live, he makes it snug and safe. There was once a poet who was very ill and had to go to the country. When he was about to leave, he was very sad because he was going to leave his friends and he thought he would be very lonesome. When he came to his home in the woods it was different from what he expected. Beside his cottage was a tree with a lark in it, and every morning he would comfort the poet with a beautiful song. He saw how the bluebird built his nest in the apple tree, and learned the habits of many other birds and found out that birds are the same everywhere. He was never sad with so many little friends about him.

' The bobolink is one of the most beautiful songsters. He sings differently from any other bird. His voice is like clear mountain air and as sweet as spring water. He has a distinct enunciation and seems to say 'Be true to me.' The bobolink is the only ground bird of conspicuous plumage. He is also the only black and white field bird east of the Mississippi River. He is unique in the way he changes his colors.

"There is another bird who is also a great warbler and he is the mocking bird. In the warm atmosphere, as in Florida, he livens the night with his music. He loves to make fun and to imitate others. But I want to tell you a secret about this little fellow. However he may try, he cannot imitate the bobolink, and listens in dumb amazement when he hears his rival's song.

"This story of the birds teaches us that wherever we go we should always be happy and cheerful like our little feathered friends. If we love the birds and all that Nature brings to us, we do not have to worship God in church, but can give thanks just as well in the great world about us."

YETTA HOROWITZ, 5 B 3.
April, 1915.

Another little girl, 5B grade, studied in march of this year the signs of spring in Burroughs' "Signs and Seasons." In May she wrote the following letter of thanks in which the second and third paragraphs are based upon her answer of two months before. Rose is 10 years old.

"Dear Mrs Pitt:

"I was amazed when the beautiful flowers were brought to our room. I was thinking what friend of ours was so kind as to send the beautiful spring messengers.

"Down in the South, the old colored woman carries a basket on her arm and so has spring lying on the dainty green moss. In the north where we live the little children go out into the woods and pick these lovely little spring messengers. How beautiful the violets are! We learned a song in the assembly called 'Violet Hunting'.

"We placed the beautiful spring messengers in a large basin and then we thought of an interfusion of a new element, a near approach to life. We placed Jack in the pulpit in the center of the basin. The purple violet, the yellow violet, the apple-blossom, the cherry blossom and the spring beauty nodded their little heads as if they were glad. I think that Jack in the pulpit was glad because he was in our room where the sun shines so pleasantly.

"The purple violet is the dear harbinger of spring. It brings happiness to us.

"We appreciate your gift very much and thank you for your thoughtfulness.

Your little friend,
ROSE UHR."

Augusta Holzer, 6 years in America, prepared and delivered the following speech at a meeting of the New Rochelle branch of

the Plant, Flower and Fruit Guild in December, 1914. She had been studying Burroughs for a year and a half.

"Dear Friends:

"I am overjoyed to find myself face to face with you, whom I have always wished to meet in order to say 'Thank you,' not as I have been saying it, in a letter, but in words spoken from the very bottom of the hearts of all P. S.—with much love and thanks and gratitude.

"I think you would be delighted if you could really know how much good you have done and how many little souls you have gladdened and uplifted by thoughtful kindness and beautiful actions. Ever since I was a little girl, or to be exact, ever since I came to America, six years ago, I was as happy as a lark every time I received some beautiful violets, daisies, pansies, or whatever flowers came to us in Mrs. Pitt's wonder box.

"And when at 3 o'clock I was allowed to take my violets home, how my mother would rejoice because she, too, loved flowers. The one who liked them best, though, was father, for he had lived in the country in Austria, and, now, in America, he says he sees nothing but bricks and pavements and machines. He has often said: 'Das ist ein stucklen von Gottes Himmel,' which means that it is like a bit of God's sky, when I've gone home with my violets.

"And not only was I made happy, but thousands of other little girls just like me. Of course, when I was younger I never had much thought of any thanks or gratitude to the kind and loving folk to whom I really owed the pleasure of seeing Nature as often as I did; but now that I am a big girl, I can reason and think more and I realize how hard it is for you people to pick these flowers and pack them so carefully.

"As far as I remember, I myself have been only twice out in the open country. The only other time that I have ever got a glimpse of Nature was when one of my teachers, Miss Blank, took me to Staten Island and to Central Park. The rest of Nature that I have ever come in contact with came to me through your efforts. And, indeed, the flowers and twigs did help me a great deal especially in my Burroughs' work. I was helped to understand better what Mr. Burroughs has written in his Nature books, and I know I learned pansies and Jacks-in-the-pulpit and lilacs from the very ones you sent to our school.

"Not only was I helped in the Burroughs work, but when I read a poem about flowers, for instance 'The Daffodils,' or 'The Fringed Gentian,' I understand that poem better, and my imagination could stretch out farther because of all the wild flowers I had seen in school and which had come from you.

"So I bring to you from my whole school heartiest thanks, and I for one am delighted to have been able to express to you just

one-hundredth part of the feeling which we city girls have toward you. Before I leave you I wish to make clear to each and every one that we not only love to look at beautiful things and give thanks for them, but we love ourselves to do good for others as you have done for us."

The children actually saw Mr. Burroughs for the first time at a birthday party at the Museum of Natural History. Here on April 10, 1912, the children of Public Schools 15 and 188G, Manhattan, presented a little play as a tribute to their friends. The sight of his kindly face and smiling eyes was an inspiration and they returned to their crowded tenement homes more than ever eager to learn what he teaches them so well.

The Club has not kept the good work to itself either, for, at the request or two well known women, they appeared before the Vacation Association, a branch of the Women's Civic Federation. Here the girls of these two schools presented their Burroughs play to show girls who work in shops and factories the beauties to be met with on a trip to the country. They added in a second scene an appeal for saving during the winter in order that the summer vacation might be spent in the country.

These playlets were most effective not only in urging members to save, but also in bringing new members into the Vacation Club.

Then in December, 1913, came the real honor of the Burroughs Club. John Burroughs accompanied the President of the Burroughs Nature Club on a visit to P. S. 188G to see the club members at work, bringing with him an indescribable influence.

This work of the Burroughs Nature Club has grown until now there are Burroughs Clubs in most of the states from New York to California.

Through the President of the Burroughs Nature Club, our school was presented with a beautiful bronze bust of John Burroughs on October 30, 1914.

The bust was sculptured by Pietro, an Italian artist, who lived with Mr. Burroughs for some time while making the bust. Mr. Pietro seems to have caught the same spirit of the man and embodied it in the bronze.

After the bust was unveiled, one little foreign child said: "It just seems as if Mr. Burroughs was looking down on little children showing us the birds and the flowers."

And so, though Nature has been banished from her haunts in Maiden Lane and on the old Bowery, though De Lancey's Farm has long since vanished, and now asphalt and bricks cover the place where stood Peter Stuyvesant's pear trees, yet a subtle influence has come back like the scent of flowers from the old Bowery and children of other nations growing into American citizenship are weaving into the lives of those with whom they come in contact strands of gentleness and beauty, sadly missing in those so unfortunate as never to touch Nature's hand, never to see her smile.

Will they and America be the better for it? Who can doubt it?

An Outline for Bird Study

I am sending in a lesson plan for Bird Study which made the pupils enthusiastic observers of birds and resulted in some real work for their preservation. If you find this material of any value for the review let me know as we are trying to teach Nature-Study by problems which will give the children aims in which they are interested for study and observation.

Very truly
BESSIE M. HAYDEN,
Critic Teacher 5th & 6th Grs.
Madison State Normal

Problem: Why may a boy be fined $5.00 for killing any bird in Illinois, except English sparrow, crow, crow blackbird, blue-jay or hawk?

I. Why Birds are protected by the Illinois Bird Law?
   1. They are of great value to the farmers and gardeners.
      a. What have you seen birds eat?
      b. They destroy millions of insects, rodents and harmful weed seed.
      c. Birds live mostly on what is harmful to useful plants.
      d. Birds common on our farms and gardens: bob-white, meadow lark, grackel or common blackbird, dick cissel, thrush, song sparrow, robins, etc.
      e. Favorite food from the plants; chinch bugs, potato beetle, cut-worms, grasshoppers, caterpillars and harmful weed seed.
      f. Department of Agriculture claims every bob-white is worth $5.00 to the farmer. (Value of a pair and their flock of 25 young quails?)
      g. Their usefulness depends on numbers:
         Meadow lark averages 87 to sq. mi. in Illinois,
         Quail " 64 " " " " "
         Grackel " 56 " " " " "

2. Birds are necessary as a protection to our shade and fruit trees.
   a. Birds that get most of their food from the trees: wood pecker, flicker or yellow hammer, bluebirds, cat birds, mock'ng-birds, orioles and martins.
3. They give us pleasure out of doors by their beauty and songs.
   a. We know birds by their size, color and songs.
   b. Birds we know having the most beautiful coloring: bluebird, oriole, humming-bird, etc.
   c. The sweetest singers: song sparrow, cat-bird, thrush, meadow lark, wren and mocking-bird.

II. Why the English sparrow, crow, crow blackbird, blue-jay and hawk are not protected by law.
   a. English sparrows have driven most of the song birds from our yards; they injure buildings, especially brick or stone buildings.
   b. Crow and crow blackbird ruin fields of sprouted grain.
   c. Crow blackbirds and blue-jays eat eggs and young of other birds.
   d. Some kinds of hawks catch young chickens.

III. How we can increase the number of valuable birds in Illinois.
   a. Enforce the bird law.
   b. Be careful not to destroy eggs or nests.
   c. Scatter food for those who stay here in winter.
   d. Build bird houses and put up in the school groves and at home.

Use of Ideas: The class made and put up 25 bird boxes on the school grounds. Nearly all boys made two or three; when a boy put a box up at the school he also put up one at home.

This work c osed on "Bird and Arbor Day."

Material: Children's experience with birds: Calender kept of birds seen; when, where, and description; look up food. Class wrote to Department of Agriculture for Bulletins concerning birds:

No 54, "Some Common Birds in their Relation to Agriculture."

No 506, "Food of Some Well known Birds of Farm and Garden". Class wrote to Illinois States Attorney for copy of Bird Law.

A Friendly Wren

A Pupil's Experience

Mary Thimmesh

I made a bird house and gave it two coats of white paint. While the last coat of paint was drying, I saw a pair of wrens that were going to make a nest in a coat pocket on the porch. I got my bird house, nailed it on top of a post near the house and took the coat away.

About an hour later, they found the house and at once began to carry sticks into it. They did not work very much through the middle of the day, but towards evening they began again.

The song of the wrens awakened me next morning and I went out to watch them. A little later when I went out, the wrens were not there, and upon looking around, I noticed the cat. I did not see the wrens again and I think that the cat caught them or scared them. The whole family liked the cat as much as the birds, for she had been their pet for about seven years, therefore they would not kill her.

A few days later, another wren found my house and began to carry sticks. He seems quite bold. One day one of the smaller children crept up to the bird house and slowly stuck out his finger. When he got close enough, the bird pecked it. Another time, the bird sat on the little boy's head and pulled his hair.

One day we thought we would feed him, so we put some bread-crumbs on the platform of his house. He would eat a tiny bit and then fly off with a big piece, which he dropped every time. Then we thought we would try some ground corn, but he would not eat it.

It was a great deal of fun to watch him brush the corn from the platform with his wings.

We thought perhaps he would like flies, so we caught some and put them in the palm of our hands and walked up to the bird house. At first he hesitated, but it was not for long. Very soon he came and sat on our hands and ate the flies as fast as he could.

We also put some small sticks in our hands which he would carry into his house, one at a time.

One Sunday, just before we were going away, I fed him some flies and he stayed on my hand for quite a while after he was through. Then he flew onto my shoulder and began pecking at some black beads which I wore.

I was planning to have my picture taken with the bird the following Sunday, but alas, that could not be. The next day we decided to put the house up higher because we were afraid that the cat might get him, and when we did so the martins came and sat on the house. Our little wren would not stand for this, so made war on the martins and got hurt. The large bodies of the martins striking against him stunned him. (I have omitted to say that a day or two before this, he found a mate.)

The morning of the last day, he flew over to the porch and alighted on my head. He flew to the porch several times after that, the last time alighting on the little boy's foot and walking up to his arm, then he flew back to his house and died.

When his mate found him, she was alarmed and tried to raise him up, but she could not and soon left.

Everybody felt badly about losing our pet, and it seemed sort of quiet the rest of that day.

Corrections

In the list of Nature Study Instructors in the February number the following corrections and additions should be made:

New Jersey—At Newark, Miss Agnes Vinton Luther is one of the instructors. Her name was inadvertently twisted to L. A. Vinton. Trenton, N. J. was omitted. Dr. R. G. Leavitt, Elizabeth P. Sheppard, and Countess Mitchum are the teachers there. Brockport, N. J. is a mistake. It should be omitted.

New Mexico—El Rito is the only Normal reporting.

North Carolina—Name was omitted on page 74. Fayetteville to Winston should be included under this State.

Studying Wild Flowers at Home

Dr. R. W. Shufeldt

FOR several summers past, my wife and I have studied botany in such a way that it enters as one of the most enjoyable factors in making up the routine of our daily life. As there are many others who love flowers as we do, it occurred to me that it might be of interest to them to learn how the study of any local flora may become part of one's life and enter into the beauty of home and home interests.

As it would to a naturalist and in a general way, the study of botany has always appealed to me, the taste having been confirmed through my instruction at Cornell under Dr. David Starr Jordan. My work in biology and allied branches has always kept it in abeyance, however, though the photography of flowers has, of late years, often commanded a large share of my time. The love of flowers amounts almost to a passion with my wife. Through the example of my daily scientific work, and through the easy access to my library, where a dozen different treatises on botany may be consulted, she is never more pleased than when she has made out the scientific and English name of any flower we have gathered, with many others, upon any of our frequent tramps over the surrounding country.

In all this work and investigation, the camera is continually called into service for the photography of flowers and plants, either as we find them in nature or in the studio after they have been

carried home; the several reproductions of my work along this line illustrates the present article.

From the gathering of such beautiful bouquets as the one shown in Fig. 1, composed chiefly of anemones, liverworts, and bloodroots, the passage was easy to bringing home the entire plant—roots and all. This soon led to various boxes—great and small, not to mention all kinds of pots and jars—being pressed into service to hold our specimens. In a little while, and after several tramps, some of the broad window-sills of our home contained boxes, jardinieres and pots, filled with rich earth from the woods, which had growing in them fine specimens of many of the very earliest spring flowers, such as a tall jack-in-the-pulpit, trailing arbutus, early saxifrage, liverwort, bluets, violets, anemones, and several more that make their appearance in the woods at the very opening of the season.

FIG. 1. Specimen of the very earliest flowers.

When such plants are thus placed, one instinctively begins to study them as they grow and develop. Every leaf is noticed as it unfolds, and the various forms it assumes up to full development is noted—not soon to be forgotten. Observation of this kind is given even more carefully with respect to the flowers when they begin to show themselves; and when the temperature outside admits of the sash being raised, it is not long before we commence to notice the various kinds of insects that visit these several species of flowers and note what each and all of them come there for. This leads to consulting the works on the entomology of the region, and among these many of the useful publications of the United States Department of Agriculture.

A little later in the year, from about the close of April to the end of May, flowering plants of a great many species are in evidence all through the woods, the meadows, the swamps, and the hill-sides. It is then that we have not only many species of these new accessions flourishing in the home, but we are enabled to gather beautiful bouquets of them to be preserved, as long as they will keep fresh, in wall-pockets, vases, and similar receptacles.

At this time, the books on botany are in constant demand, and special study is given to May apples (Fig. 2), ferns (Fig. 3), and the yellow iris (Fig. 4), all of which were photographed by me *in situ* in the woods. Later, we have the moth mulleins, the wild geraniums, the lupine, and a great long list of others altogether too extensive to enumerate. Our home is rendered doubly interesting through bringing all these woodsy plants into it.

FIG. 2. May apple or Mandrake (Podophyllum peltatum).

Should one care to carry this home study of wild flowers still further, it is not difficult to collect them for an herbarium devoted to the flora of the region. One must learn the best methods of pressing and preserving them; each specimen must be duly labeled, dated, and named—both scientific and vernacular names appearing in the data—and finally a fine cabinet is formed in some spare room of the house. After a while, one will be surprised to find how many kindred souls there are in the world along such lines of study. They crop up in the most unexpected places—all the way from a

casual acquaintance in the street, to running across the real nature-lover taken red-handed in the woods.

One of my chief delights in the home-study of botany is, as I have said, the photography of wild flowers, which is something I have done for a good many years, and trust to do for a good many more. This part of my story, however, would make quite a little volume; even the main particulars would form a pretty long article. So that must be left for another time, and for the present the photographs here reproduced must stand for the demonstration of my methods in various lines of photography. However, I would say that there are a score or more of delightful and popular books on the botany of the Eastern United States in the market at present; all the other appliances required, such as presses, microscopes, and other needed accessories, can be obtained at any of the first-class biological establishments.

FIG. 3. One of the early ferns. Note the "Daddy-long-legs hiding in one of the fronds.

In closing this article I want to answer a question which has frequently been put to me, with respect to which part of the world I have enjoyed the most in pursuing such studies; I will also take occasion to register a protest here against the wanton destruction of wild flowers in the environs of our cities and towns.

At different times in my life it has been my fortune, as well as my privilege, to have passed through forests, rambled over fields, and climbed the sides of mountains in not a few, very different parts of the world. Early in my life—indeed in my boyhood—at

a time when the naturalist in me was beginning to assert himself, the dense tropical forests of Cuba and southern Mexico made their indelible impressions upon my young mind. Later on opportunities came to me to contrast these with the subtropical jungles, bayous, and the forests of Florida, Alabama, Louisiana, Texas, New Mexico, and Arizona; while during the span of early manhood at all seasons of the year, from the peaks of the Big Horns to the shores of Long Island Sound, southward and westward to the Gulf, not a little of the wild part of our great continent was more or less known to me.

FIG. 4. Yellow iris.

As I glance backward over that period of my life, with the view of satisfying myself as to which of all these wild or forest districts, which of these still uncultivated regions, far from the homes of men, most strongly appealed to me, I find it hard to answer; as a matter of fact, my mind has never been satisfied on this point, so interesting and so fascinating are they all, each after its own kind. One thing is certain, however; from the very first peep of spring to the death of the last day of autumn, the woodlands, and all that goes with them, in various parts of New England are very hard to beat.

To nature students from less favored districts it is a veritable source of marvel to note the wealth of plant life, with all its flowers and blossoms, that spring into existence through the woods, in the fields, and along the waysides everywhere, just so soon as the vernal season is ushered in; and it would seem that, nearly every

day thereafter until winter calls a halt, new additions are being made to this wealth of flowering plants, and to this unrivaled flora as a whole. This is true even of the near vicinity of almost any of the large cities in the part of the country designated—a great metropolis, such as New York City, for example, forming no exception to the rule.

For a number of years past, my studies along the lines defined above, have been, for the most part, confined to certain restricted areas in southern Maryland; to similar kinds of country in northern Virginia, and to the wild, unsettled parts of the District of Columbia. There is a superb flora throughout this area, flourishing, as a rule, from about the latter part of March until frost cuts it short in November; even then, dandelions will sometimes crop out in January in favored places. It was through the above sections of the country that I obtained the results reproduced in the present article.

All through the vernal season many people, representing various classes, go into the woods, and for various reasons and purposes. Picnicing parties, ranging all the way from five or six people to a hundred and fifty and more, resort there continually, until the cold season prevents such excursions entirely. As a general thing, the majority of those forming such parties care not a straw for wild flowers, and the consequence is that many of these are destroyed all around the locality where their picnic is held. Then there are absolutely scores of others who are rural vandals—their love for flowers is but a mere veneer; and when they go into the country to gather them, there is no end to their pillaging. Without rhyme or reason, large armfuls are plucked in an almost aimless fashion, only to be thrown down by the wayside as they near the suburban car-line that carries them homeward. This is the class which has succeeded in exterminating many of our most beautiful flowers that formerly grew in abundance up to the very line of the city limits. Trailing arbutus, wild violets, and similar plants, have all suffered severely at the hands of such people, who, as I say, are not satisfied with merely plucking even more than they need, but who tear up the plants by the roots—very often only to throw them away a few moments later.

Again, I have met with some who stroll through the woods and fields simply for the exercise and change there may be in it for them. After their walks, persons of this kind cannot, sometimes,

even say whether they noticed any wild flowers or not; as to their giving the name of any of them—that would be quite beyond their ability. Generally they are poor observers of much else in the world, and their further consideration here would avail us nothing. Others, of a better sort, love and admire wild flowers ardently; but they never get beyond that. When away from them, the objects of their admiration are soon out of mind. We see, on the other hand, still another class quite different from any of these—the "closet-botanists," who study wild flowers much as a medical student studies his material; the beauty of the flowers is lost in the haze of technique and nomenclature. But I must close here for I have filed my protest, and expended the full quota of my space allowance in telling my story, which I hope may have the effect of inducing many a one to go botanizing with a camera.

Nature Photography

E. D. HUNTINGTON

Nature photography affords a most interesting and instructive avocation for the lover of nature. To tramp the fields, woods and swamps in search of suitable subjects to photograph is as fascinating as it is enjoyable. But the task is difficult—much physical exertion is necessary to carry camera, tripod and plates over rough country; the plant always seems to grow in a place where it is next to impossible to manipulate a camera; and the wind keeps the plant constantly nodding. Often the light is unfavorable for an exposure and one commonly stumbles upon the rarest of flowers just after he has exposed his last plate. And then at home, that night, development too commonly reveals a failure with ones choicest subjects of the day.

But the uncertainties and difficulties add to the joys of nature photography. And when one holds a plate, dripping wet, to the ruby light and watches a perfect image of some delicate orchid or other rare flower (Fig. 1) gradually develop, he feels well paid for his labors and forgets his disappointments over a dozen failures.

It is really surprising how quickly an observant person can acquire skill in the photography of nature's beauties. And since any success is primarily dependent upon the use of a suitable camera, plates and chemicals, the prospective photographer must select his apparatus with great care.

Choice of a Camera

A really focusing camera is absolutely necessary to photograph close objects such as an animal or small plant; a Kodak with portrait attachment is not satisfactory.

The cheaper sort of Kodak has what is known as an *universal lens*, which means that everything in the field of vision is in fairly good focus, but no part of the field is sharply focused. The so-called focusing Kodak has a semi-universal lens which is more serviceable in that it gives a sharper definition of certain objects of

Trillium grandiflorum

the field of vision. While the latter is quite useful for landscape and group work, its results are not sufficiently good on close objects to make it satisfactory for nature work.

A camera to give the best results must have at least the following specifications: (a) long extension bellows (18 inches to 3 feet depending on the size of the plate) with ground glass back for focusing; (b) revolving back (so that the plate can be used with its long axis horizontal or vertical) adapted to receive plate holders; (c) heavy tripod (proportional to the camera's weight); (d) compound shutter acting on both time and snap-shot; (e) iris diaphragm; and (f) focusing lens, preferably an anastigmat.

The better class of cheap lenses are either listed as *rectilinear* or *anastigmatic*. The *rectilinear* lens is defective in that it is impossible to focus at the same time vertical and horizontal lines lying in the same plane. This defect is corrected in the *anastigmatic* which makes it possible to use it with a more widely opened diaphragm. The latter is slightly the more expensive.

In addition there is needed a black focusing cloth, at least six double plate holders, and a carrying case. For general work a 4 x 5 camera will prove most efficient, although a 3¼ x 4¼ is very satisfactory, is cheaper and easier to carry; for the highest grade of work a 5 x 7 gives the best results. It is more readily focused with precision since the image is larger.

Before buying a camera, the prospective purchaser should make a study of the catalogs of the different camera manufacturing concerns; these catalogs may be obtained free from your local dealer. If possible the aid of some person who has had considerable experience with cameras—*not Kodaks*—should be enlisted. Not infrequently, a first-class camera in perfect condition can be picked up second-hand at about half the list price. But the novice needs to be very careful in purchasing a used, or new, camera, as the trade is full of chicanery.

Sweet, Wallach & Company, 133 N. Wabash Ave., Chicago, is a thoroughly reliable concern which issues monthly lists of used outfits they have for sale; it is well to consult the lists of such dealers. The large mail order houses, such as Sears, Rœbuck & Co , carry first-class cameras at reasonable prices, and their catalogs should be consulted by the prospective purchaser.

A complete 4 x 5 outfit such as described above can be purchased at prices ranging from $25.00 to $50.00 and used outfits much cheaper.

The graflex and similar cameras are built for speed work, and are not suitable for high grade nature work *unless mounted on a tripod*. Obviously they possess no advantage in nature photography (except specialized bird or insect work) over the regular and much cheaper camera, and the price is much higher.

Plates

The ease with which the films are handled in the field is more than counterbalanced by the difficulties and limitations incurred with them in the dark room, in making prints and in lantern slide

work. Plates are cheaper than films of the same quality, and will give better results in the hands of the average worker.

For nature work, the writer has found the following plates very satisfactory: *Seeds Ortho L, Hammer's Ortho.* and *Cramer's Medium Isochromatic.* Of the three, the latter has proven decidedly more satisfactory than either of the other two. There are other plates on the market probably of equal value with the above.

Preliminary Work

The novice should acquire an acquaintance with his camera and an introduction to developing by confining his first efforts to landscapes, trees, buildings, etc. Here the help of someone who has had previous experience in photography will be of great value. Suppose a tree in the open is selected as the subject to be photographed, the procedure will be as follows:

The plate holders should be loaded with the plates, in a light-tight room which should be illuminated by a ruby light; if no "dark room" is available, almost any room will serve after dark if the shades be drawn. The plates should be placed in the holders with the emulsion side (coated with gelatine and silver salts) out, or the uncoated glass side in. The sides can be determined by reflecting the ruby light from the two surfaces. The coated side appears dull, the uncoated side shiny.

The camera on the fully opened tripod must be placed so that its back is to the sun, which may of course be either somewhat to the right or left. The diaphragm should now be opened wide, the time pointer set at "T," and the shutter opened. The photographer adjusts a black cloth over his head and the ground glass of the back, and moves the lens forward or backward until the object seems in fairly sharp focus. The exact focus is then obtained by use of the rachet screw that moves the travelling bed to which the lens-holder is attached. (In purchasing a camera see that it is provided with this.) It is probable that the image of the object will be too large; if so the camera must be moved farther away from the object, and refocused (the lens will need to be run back toward the ground glass); if the image is too small, the camera must be taken nearer the object, and refocused (the lens will need to be run toward the object). Bear in mind that the nearer the camera is to the object, the larger the image will be, and vice versa;

and that the nearer the camera is to the object the farther the bellows will need be extended, and vice versa.

Having focused the image satisfactorily on the ground glass, decrease the diameter of the diaphragm until its pointer is at F 11 or U. S. 16 (depending on which scale is used), close the shutter, introduce a loaded plateholder unto the back, and withdraw the slide next the lens from the plateholder. Everything is now ready for the exposure, the length of which should vary with the plate used, the time of day, the time of year, the condition of the light (whether cloudy or bright) and the nearness to the object. Let us assume that it is a fairly bright day, somewheres between 9 A. M. and 4 P. M., in March, that the distance from the tree is over 50 feet, and that Cramer's Medium Isochromatic plate is being used; the exposure should be between two and five seconds. The writer recommends that three plates be exposed, one, three, and five seconds respectively, from the same point and the resulting negatives be compared. Good results may be obtained from a much shorter or somewhat longer exposure. The times of exposure given in the tables issued by camera and plate makers are minimum, and need be short if moving objects are to be photographed, but the best results are to be obtained from long time exposures.

The slide should be returned to the holder with the dark edge outward (to indicate that it has been exposed) and the holder withdrawn from the camera.

The three plates may now be developed in a dark room (light-tight) illuminated with a faint ruby light. The writer recommends the use of Eastman's Hydrochinon developer which may be bought in powders but many other developers such as metol-hydrochinon will also give good results, and are preferred by many photographers. The powders should be dissolved according to directions, and poured into a freshly washed tray (6 x 8 inches is a convenient size). A tray of acid hypo (fixer), dissolved according to directions on the package, should also be at hand, as well as a tray of clean water.

A single plate should be placed in the developer, emulsion side up, and quickly covered with the developer fluid; it is well to wipe the surface of the plate with a wad of absorbent cotton wet in the developer to insure complete contact with the developer. The tray should be rocked for the first minute; the image soon appears, and development is continued until the high lights of the

subject can be distinguished as dark areas on the back of the plate, even if the emulsion side becomes entirely black. At this point, the plate should be removed from the developer, washed in water and put into the fixer, which will dissolve out the unused silver salts. It should remain in the fixer twice as long as it takes all the white of the emulsion to disappear, which will be less than 10 minutes with a fresh solution.

Glass or hard rubber-fixing baths with room for a dozen plates can be used when developing several at once.

When the plate is sufficiently fixed and cleared, it should be washed in running water, or else in frequent changes of water, for at least one-half hour. It is then ready for drying, and may be placed on a special drying rack, or leaned against the wall. When dried, it may be compared with the other plates which have been developed, fixed and washed n a similar way, by holding them to the light and looking through them. A clear sharp "negative" image should be seen. If the negative is opaque, it has been over-exposed; if the image is faint it has been under-exposed.

Ability to use the aperture of the diaphragm at different diameters, and with different speeds, will develop with practice. The following may serve as a general rule. A wide opening of the diaphragm necessitates less time than a narrow opening, but the sharpness of the negative is proportionately decreased; and a narrow opening of the diaphragm necessitates more time, and the sharpness of the negative is proportionately increased. Some form of exposure meter is a great help in determining the correct time of exposure.

What Shall Be Our Policy Concerning Gardening in the Elementary City Schools?*

By C. D. Jarvis

U. S. Bureau of Education

To vitalize their school studies, or to facilitate the acquirement of a knowledge of the essentials in education, children need some kind of active experience in the affairs of life. Before the excessive centralization of population such experience was provided by the

*Paper presented at the Annual Meeting of the Am. Nat. Study Society, Columbus, Ohio.

varied activities about the home. Our school system has not conformed to the changing conditions under which people live.

To facilitate the free choice of a vocation, children should be provided with a kind of training that will acquaint them with the advantages and opportunities in the chief industries. According to the 1910 census, ninety-five per cent. of our people are engaged in either agriculture, industrial work, commerce, or transportation. Our present system offers little opportunity for children to gain any idea of the character of these predominating occupations. If our boys and girls are to select from any of the occupations for which our schools prepare them, they must choose one in an already overcrowded field.

To train children in habits of thrift and industry; to develop stronger-bodied children; to make it possible for children to remain longer in school and to escape the evils attending early confinement to shops, mills and mines; to make it possible for children to contribute to the support of the family while attending school and to convince parents that it is worth while for children to continue their school work, boys and girls should be provided with interesting, wholesome and remunerative employment at an early age, and while attending school.

To supply these needs for the benefit of children in towns and cities there is no more available means than that offered by productive gardening. In most cities, there is abundant land in the form of back yards and vacant lots that should be used for educational and economic purposes. Where home back yards are available they should be used by the children of the family. For children who live in homes without back yards or without sufficient land, vacant land near the home usually may be obtained. Where such land is used, each child, wherever possible, should be given a piece of ground equivalent in size to an ordinary back yard or as much as he or she can manage. Each of these assigned plots always should be regarded as the child's home garden rather than a part of a school garden. In other words, the child should assume the responsibility, rather than the school.

In the congested areas of a few of the larger cities it will be difficult to find sufficient land to conduct the work on such a broad basis, and, in such cases, we shall have to be satisfied with the small plot idea so commonly employed at the present time. Gardening on these small school plots offers an opportunity for

children to acquire a limited knowledge of the phenomena and forces of nature and affords a wholesome form of recreation, but does not give a child a fair idea of the possibilities of gardening nor does it provide a remunerative form of employment that will go far toward encouraging thrift and industry and in making it possible for children to earn their way.

In order that children may get the most from their home project work in gardening, a teacher, trained and skilled in gardening, should be provided for each school or for every 100 or 150 children of the gardening age. This teacher should be engaged for twelve months with provision, if desired, for a vacation during the winter. Such a teacher may devote her forenoons during the school year to the teaching of agriculture, nature-study, elementary science, home-making, or other special subjects. Until the people come to believe that it is worth while to teach these subjects in the elemenmentary schools, we may require a specially qualified grade teacher to instruct the children of the whole school in the subject of gardening. Some cities now are engaging a good supervisor of gardening with a view to training and supervising a number of their own teachers. The teachers selected for the purpose are engaged for twelve months and are given special remuneration to compensate for the additional time and labor expended.

The instruction afforded should be largely of a practical nature and should be given in the child's home garden. The teacher who is responsible for the work, however, will have much to do during the winter months. She should be able to show the other teachers how the work of the garden may be correlated with other subjects, and she will need to make individual garden plans so that there will be no delay when the gardening season opens.

After school, on Saturdays, and during summer vacation the teacher directs the work of gardening. After all preliminary preparations have been made and the planting season has arrived, she instructs the children in their own back yards. During the rush season she works with groups of about ten or twelve. For the benefit of the children within a restricted area she demonstrates on one afternoon, the methods of preparing the soil and planting the seeds. The next afternoon, she does the same thing in another section for the benefit of the ten or twelve children there. This program is continued until all the children assigned to her have seen these preliminary operations performed. She then demon-

strates other phases of the work in the same way. Later in the season, and especially after the school has closed for the summer, she would make visits to the individual gardens and encourage the children to take good care of their gardens and to see that they keep up a continuous supply of vegetables for the home and market. A large gardening business may be conducted on a very small area, and children should be shown how to obtain maximum results.

The teacher should also instruct the children in the best methods of marketing their produce, and in the work of storing and canning vegetables for winter use. Anything that will broaden out the range of experience will be worth while.

Accurate accounts of costs, receipts and profits should be kept and the whole project should be put on a business basis. It is not advisable to donate seeds and other supplies to children. They should be expected to pay for everything that they use, and thus encourage an independent and self-reliant spirit. Lack of sufficient funds, however, should not prevent any children from securing supplies sufficient to make a profitable home project. Some fund, from which children may borrow money with which to buy supplies, should be provided. This affords an opportunity for a good lesson in the use of borrowed money, and in business integrity.

The gardens should be made as profitable as possible, for all the benefits that come from the work are in exact proportion to the profits. The work of the past few years has shown that children, with proper instruction and supervision, can carry on much larger projects than we have believed possible. This is especially true in the home-garden work where children may have some assistance from the parents.

The strongest inducement that we can hold out to children to conduct a project is to promise and insure a profit in dollars and cents. If the work is not profitable, the children, sooner or later, will lose interest. Some well-meaning people have tried to maintain the interest by holding up before the children the chance of winning a prize for good garden work. In most cases, such effort has resulted only in temporary benefit, and in many, it has actually defeated the aims for which it was undertaken. Where prizes are offered, children focus their attention on the prizes and, too often, lose sight of the real advantages of the work. Whether we should give prizes to children for the purpose of encouraging them to do things that they ought to do for their own benefit, is doubtful, and

the feeling that it is all wrong is a growing one. The use of achievement badges is decidedly a safer way to maintain interest, for such badges call attention to the achievement itself.

In conclusion, then, we believe that the work of gardening is of great benefit in the training of children in towns and cities. We believe that the work should be conducted on an intensive, business-like and profitable basis. To insure this, qualified teachers should be provided for groups of children not exceeding 200, and such teachers should be retained throughout the summer. We further believe that the work should be made so attractive that it will be unnecessary to offer prizes to maintain the interest of children.

School Gardening a Fundamental Factor in Education

LEROY H. HARVEY

A survey of the graded school curriculum for the last twenty years shows it to have undergone constant repair. To keep the course of study even within a decade of current and progressive thought has been the *magnus opus* of educators especially concerned with this phase of our public school system. The dogma of the three R.'s, as an educational panacea, has proved a failure, an aid to mental indigestion and even ofttimes has led to mental or physical incapacity. However, the tenacity of this dogma has served a purpose, for revolution has given place to slow evolution of the course. And there can be no question but that further progress is inevitably looking toward the most insistent demands of our modern social and economic organization.

We are constantly alarmed by the announcements of sociologists that crime, insanity and degeneracy of a pronounced as well as subtle nature are on the increase, a condition which is especially dangerous as the results are cumulative. We must look almost entirely to the public school for vigorous corrective and preventive measures and the curriculum of the graded schools seems to occupy the strategic position in our educational system. It is not that a child should know so much English, so much History, so much Mathematics as it is that he should leave the school with a healthy body, a healthy mind, and noble ideals. The preponderating significance of this becomes forcibly evident when we consider that 60% of our school population terminates its school training for life

with the eighth grade. And that one-third of our children are repeaters and this due mainly to physical defects.

Looking toward the accomplishment of this higher ideal in physical and character development—Nature-Study and School Gardening are demanding universal admittance to a place in the graded school course of study, commensurate with their demonstrated value to accomplish these ends—an accomplishment which even the most loyal supporter of the common branches must candidly admit.

In the first place we may call attention to the fact that in the social history of our race we find an unanswerable argument for this work. The story of social evolution is fundamentally, in point of cause, a story of soil culture. The hunting stage gave way to the pastoral stage with the subjugation of animals. The semi-barbaric life of this latter stage passed with the domestication of plants and the advent of the agricultural period. Cultivation of the soil was the fundamental cause in the origin and evoluion of the home, village, society and civilized life, while to-day agriculture is the solid warp of our social fabric whose woof is as multiple and labile as the genius of man.

Specialists tell us that the child in preadolescent development passes through these stages of savagery and barbarism. To deny the child the influence, during these periods of his development, of this underlying factor of social evolution is to negate the educational doctrine of recapitulation, to turn him into the world out of harmony with and unprepared to take his place in a society thus determined and is a reversion to barbarism out of which the race has so painfully and laboriously toiled. The soil is pregnant with forces for the normal and healthy development of the child in character, mental training and physique, just as it is potential to produce splendid crops under adequate culture. It may also be noted that intensive utilization yields proportional results in both cases.

We may now proceed to an analysis of the influences of soil contact as it reacts upon the child. (1) Garden work is auto-educative—if such a thing is possible—to an extent unequaled by any influence which the graded school can bring to bear upon the child. The results of his planting and care stand forth evident to all, including himself, powerfully reflecting the child's habit of work and thought. Slovenliness confronts him in irregular rows,

scattered seeds and later weeds. Contrast results in stimulation oft repeated and usually fructifies in a prize garden next season. In the garden care and patience bring their rich reward and create confident expectation as the result of energy and application, a valuable asset to any individual throughout life. Here the child comes face to face with the forces of nature and learns to organize his energies in harmony and co-operation therewith and is forced to realize that antagonism reaps disaster.

(2) Soil contact creates producers. The School Garden for the first time in most cases brings a feeling of possession; it is all his own. The child reaps the reward of his industry and labors and there rises in his soul the exhilaration of self-expression, the joy of producing and the satisfaction of honorable profit. Herein lies the secret of making producers of our children and instilling a dignity in labor.

The world moans with an over-production of non-producers—that great class of middle men—those of the "clean-handed" occupation who prey upon the producer and the needs of others. What the world needs is less second-rate citizens and more first-rate producers. This is the great economic and social need. It is so easy for our boys and girls (this 60%) to drift into the "go-betweens." They have never experienced the exhilaration of adding to the world's supply, so are sucked as by a whirlpool into the rising flood of consumers. We have scarcely evaluated the potential social force thus diverted. Upon our souls rests a serious social crime when we fail to provide this opportunity for our children, and obviously the duty lies at the door of the public school system.

(3) School Gardening instils civic interest and engenders the æsthetic. The possession of a garden plot brings the child at once to the realization of property rights; first his own and then his neighbor's; a lesson frequently fought out as man to man. This golden rule of property right rises primarily from the savage instinct to defend his own but is ameliorated through contact and the child has forced upon him a great lesson. Individual rights develop into general rights of all and an interest and pride in school and public property results. The child thus becomes a civic guardian of law and order. And particularly is this important in the Americanization of the children of our alien population.

Garden possession during the elementary school years would go far toward the elimination of many of our social and economic

evils which are a serious burden upon us all. If we could secure universal adoption of school gardening throughout the eight grades of our public schools in a few years, our prisons and houses of correction would decay from want of use.

(4) Garden work results in developing the faculty of co-operation. The establishment of villages in the agricultural stage of our social development soon resulted in a division of labor for economical reasons. There soon appeared the tinker, the tailor and the candle-stick maker. Each individual of that society now becomes more dependent upon the other members of the community. As civilization progresses the division of labor becomes more minute. The little shoemaker gives way to the gigantic shoe factory and a hundred hands become linked to a single process where one was sufficient for its accomplishment before, but with a gain in both quantity and quality of product. Never has society been so complex and so intricate as it is to-day. Reflecting this we find its members more inter-dependent than ever before. Inter-dependency forces the necessity of co-operation and the future holds nothing more certain than further individual helplessness. Success then under this economic condition seems to vary directly with one's ability to co-operate with his fellow-man. "Science and co-operation play leading roles in each day's business," however great, however small.

In the garden both of these accomplishments are unconsciously attained. The child is trained in science and partially acquires its method of approach and its attitude of mind. In thus training the mind to an exact and impartial analysis of facts Nature-Study and School Gardening furnish an education pre-eminently fitted to start the child on the road to sound citizenship. It is not so much the material but the method of its consideration.

Garden work offers, through the organization of Children's Garden Clubs under the auspices of the School Garden Association of America, unusual opportunities for training in co-operation; a training sadly needed to offset the usual anti-social competitive system which permeates our grade schools. Co-operation especially functionates in the establishment of comradeship in a common undertaking, in the stimulation of initiative and in the production of leadership. Personality is here unmasked and common sense and industry reach their proper valuation.

Co-operation is the *modus operandi* in the business of the world. Why not initiate our children in our institutions which proudly

proclaim themselves "preparatory schools for life." The School of Experience is dear in time and money. School efficiency demands training in co-operation. In the garden human character is openly revealed and evalued by the child's fellow workers. In the placing of reward the judgment of the child is far less liable to err than that of his teachers. If for no other reason than exhibiting to the teacher the true child nature with which she works School Gardens are abundantly justified. Without prolonging argument on this point it is evident that the world places highest value upon science and co-operation. Can we do less than lay the foundations?

(5) Soil contact fosters adaptability, resourcefulness and self-reliance. The farm has been highly favored as the nursery of men of affairs—notwithstanding the higher percentage of immorality and disease and its lower social and educational standards. I need not present the statistical evidence pro and con upon this claim. The general acceptance of such a belief demands our attention and is quite in point in our consideration. Prof. Bailey has made the statement that in his teaching experience he has found that the country boy could turn his hand to twenty things when his city cousin was able to handle but one. It is my belief that the city with its greater social and educational advantages and its higher hygienic standards is to-day the most desirable place for young America, and this without depreciating the value of training of farm life. It is further my conviction that the School Garden will supply just the training which farm life has provided and without its serious limitations. The imperative need of the School Garden in the city is thus forced upon us.

(6) The "missing link" between home and school is the school garden. Inefficient is a school garden which does not reflect itself in a home garden. The path is now straight and smooth. Teacher must visit the home garden, a natural and unforced entrance to the home—and a better understanding of the child and his needs result. Mother must visit the little plat at school—an interest, sympathy and understanding follows. Home and school may now work in co-operation. To the child there comes a great pleasure and happiness which stays with him through life and which makes of him a more nearly normal man or woman with widened interests. Whether he turns this to practical purposes in seeking a livelihood matters not; he has an equipment which will furnish him splendid recreation and diversion in later life. The purpose of School Gardens is not primarily to make agriculturists but to make men.

I am not unaware of the difficulties and problems concerned in garden work. I am sure that a slow beginning is better than a rapid failure, that thorough organization is better than enthusiastic abandonment, that there is a real problem involved in the summer vacation and acquisition of ground; yet I am equally sure that these problems have been satisfactorily solved and can be solved by any school with a purpose. Such are problems without the purpose of this discussion. In conclusion School Gardens are not only good but fundamental in the training of our citizenship of to-morrow; they are potential in the conservation of child life and finally in the words of Dr. Eliot—"the most living work laboratory of any dimensions is the school garden. The time is coming when such a laboratory will be as much a part of a good school equipment as blackboards, books and charts are now."

News and Notes

Dr. R. W. Shufeldt of the Medical Corps of the Army was elected active president of the newly formed Washington Aquarium Society.

Announcement is made that for two weeks during the summer of 1916 a party of students and their instructors from the department of forestry at Cornell will be in camp on a forested tract at the south end of Saratoga Lake.

This summer course in practical forestry in the woods forms a regular part of the work in the third, or summer, term at the state college of agriculture, and the transfer of faculty and students from Ithaca to a forest area is made for the purpose of getting first-hand information in the woods themselves.

Courses will include forest measurements, forest utilization, the study of tree growth, and forest management.

The party is limited to seniors and graduate students who are regularly enrolled as candidates for the forestry degree. In 1915 there were twenty students at the camp which was held, during the past summer, in the northern Adirondacks. On the tract an estimate of the standing timber was made, and a general plan for management was drawn up. A similar study will be made on the Saratoga tract, with this difference; because this area is nearer to numerous wood-using mills greater attention can be paid to the problems of close utilization of lumber and other forest products.

Book Reviews

Wild Bird Guests. How to Entertain Them. Ernest Harold Baynes. pp. xviii + 326. Preface by Theodore Roosevelt. E. P. Dutton Company. $2.00.

This is one of the most attractive bird books that has come to the Review Table in a long time. Possibly it is because the Reviewer has arrived at the stage where he is particularly interested in attracting the birds. To the bird lover who is established and wants to make his home grounds a bird resort, the book will be full of valuable hints. It is exceedingly interesting reading, also, for anyone who has the welfare of the birds at heart. The chapters on the destruction of bird life by inclement weather, disease, natural enemies and man, are replete with striking facts and are illustrated with excellent photographs of many of the birds' worst enemies. Among these pictures are those of the skunk, the weasel, the raccoon, the opossum, snapping turtle, and the bull frog. Chapter five is on the economic reasons for protecting the birds and the author classifies the wild birds into those that are always beneficial, those chiefly beneficial, those in which the beneficial and the harmful qualities about balance, and those that are distinctly harmful. The latter list includes only the sharp-shinned hawk and Cooper's hawk, for the United States. Under the caption "The Entertainment of Wild Birds in Winter," there are given valuable directions regarding bird foods and bird shelters, together with detailed diagrams showing the construction of the latter. One of the most valuable features of the entire book is found in Chapter eight. It is a list of the native and introduced trees, shrubs, and vines that bear fruit attractive to birds. The chapter on bird baths and houses is explicit, and the illustrations show a number of different types. The final chapter, on bird clubs, gives an account of the work of some of the conspicuously successful clubs, tells what clubs may do, and there is given in the appendix a typical constitution which will aid very materially in the establishment of such local organizations.

The American Boys' Book of Bugs, Butterflies and Beetles. Dan Beard. pp. ix + 309. J. B. Lippincott Company. $2.00.

We have all come to recognize that when Dan Beard sets himself a task in the interest of the boys, it is sure to be well done. This

book will be a delight to many a youngster who wants to know something about the insects of his environment. All too often the books which he encounters in the school or public library to which he goes for information are so filled with technical terms that they promptly discourage his out of-door-enthusiasm. This book, however, is written in an exceedingly interesting way, and with as little scientific nomenclature as is possible. The directions for collecting, spreading, mounting insects are explicit; then come descriptions of the more common butterflies and moths, making up nearly half the book. The rest of the book is devoted largely to the beetles, with some space given to the more common bugs. The book is illustrated with numerous pen-and-ink sketches which serve admirably in identification.

THE MAGIC FOREST. Stewart Edward White. Pp. 146. The Juvenile Library. 50 cts.

This is the story of a white boy who unintentionally stepped off of a transcontinental train and was left behind in the Northwest. In his wanderings, he encountered a roving band of Indians who temporarily adopted him, and he leads a life of intense interest in the forest. "Jimmie" is the chum of one of the Indian lads who undertakes to teach him the wood lore. Together the boys fish and hunt, and the story tells of many of the wonderful experiences they had. The tale would not be complete without Jimmie's return to his own home, and to his worried parents. And so the tale ends as it should.

THE TREE NOTEBOOK. By Anna Comstock. 160 pp. Comstock Publishing Co. 30 cts.

THE FISH NOTEBOOK. By Geo. C. Embody. Comstock Publishing Co. 30 cts.

These books are uniform with the flower and bird notebooks already published in this nature notebook series. The Tree Notebook gives a number of illustrations of terms that are in common use in the descriptions of trees; then there follow pages illustrating the differences between trees that are likely to be confused, such as the various kinds of poplars, willows, maples, and oaks. The bulk of the book is made up of a series of uniform blanks which the pupil is to fill in the study of trees that he encounters. The final pages of the book are designed for the study of evergreen trees.

In the Fish Notebook, there is a preliminary description of the main features of the external anatomy of the fish. Then follow blanks for the field notes on fishes. These are not blank pages, but printed forms to be filled in, indicating the form of the body, characters of the head, number and kind of fins, and so on. There then follow thirty-three plates of common fishes, giving illustrations of fifty-five fishes.

THE FERNS OF ALLEGHENY COUNTY, PA. Lewis S. Hopkins. Pp. 130. Published by the Botanical Society of Western Pennsylvania, Pittsburgh. $1.25.

This is the third Annual of the Botanical Society of Western Pennsylvania, with headquarters at the Carnegie Museum in Pittsburgh. It is an exceedingly handy little pocket manual of the ferns and their close allies, the horse tails and club mosses. It is admirably illustrated with photographs of the many species described. Since many of the ferns of this region are common throughout the northern United States, the manual would be a very helpful companion for any Nature lover in this general section. The descriptions of the ferns are not only scientific, but there is also a deal of interesting Nature information, together with literary quotations, in the volume.

PRACTICAL LESSONS IN AGRICULTURE. Lester S. Ivins and Frederick A. Merril. Pp. vi + 223. American Book Company.

Here are given a series of 142 lessons arranged seasonally. The book might almost be called a laboratory guide, if you may consider that the farm is the laboratory. Many of the topics treated are of interest to the Nature-Study teacher. The book is rather disappointing in that while there is considerable space given to and directions for out-of-door work, or work with actual material, yet a great deal of the volume, while in lesson form, is just descriptive matter. For instance, eight pages are devoted to birds. Six common birds are briefly described, and their food is indicated, to show that familiar birds are beneficial. Six more are listed in a chart, with directions to fill in the food they eat, where they are found, and their feeding time. One lesson is devoted to bird migration, with space for recording winter residents, summer residents, and so on. In the list of books given, there are none mentioned that deal with birds, so that apparently the student is left to his

own resources to find the names of the birds that he is supposed to know and list under these several headings. The book is suggestive, however, and would be a helpful manual to use in a course in agriculture.

Soils and Soil Fertility. A. R. Whitson and H. L. Walster. Pp. 315. Webb Publishing Co. $1.25.

The book is a clear statement of the origin, nature, and types of soils. The customary subjects are discussed, including chemical composition, methods of analysis, fertilizers, drainage, humus, etc. In the closing twenty-five pages of the book, there are given a number of laboratory exercises to be taken in connection with each chapter.

The Three Gifts of Life. By Nellie M. Smith. Pp. Dodd Mead & Company. 50 cts.

This is an attempt to present the facts of reproduction in plant life, animal life, and finally in human life. The statement is simple, modest, and adapted to the boy or girl. It belongs to the class of books whose influence we can only know after considerable experience. It is a sane and careful presentation of the subject, so guardedly written that it might well be put into the hands of the inquisitive child.

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VOL. 12 MAY, 1916 NO. 5

The Organization of Nature-Study*

OTIS W. CALDWELL.

It is probably a safe statement that the elementary schools throughout the United States are now conducting more studies in nature than at any previous time since the introduction of nature-study into public schools. This statement is based partly upon general impressions, but chiefly upon exact information which has been secured. In the states of Indiana and Illinois which were taken as types, information from nearly 400 school systems shows that something like 80 per cent of these schools are now teaching nature-study in one or more grades. Some of these schools are teaching the subject in all of the eight grades, and practically all of them teach it in at least four years. Less definite information from most of the other states indicates an essentially favorable situation, while in a few states very little attention is given to the subject. It is evident that notwithstanding the intermittent nature of public advocacy of nature-study as means of education of children the subject has grown in favor until it has now come into fairly general use.

Need of Organized Courses

The definite studies of conditions in Indiana and Illinois referred to above, the less definite impressions secured regarding conditions in other states, and almost constant requests by correspondence, show a wide-spread and definite desire for a better

*Paper presented at the Annual Meeting, American Nature-Study Society, Columbus, Ohio, Dec. 1915.

organization of courses in nature-study. It is probably fortunate that there have been and will yet be many rather restricted attempts to organize courses of study, since through this kind of experimentation much has been learned regarding the material and the plans of procedure which are or are not appropriate for use in effective instruction in the schools.

We are not without school people who believe that nature-study work should proceed in an unorganized way as heretofore, and that each school should develop its own plans. I may cite one large school system with a score or more of different schools and a total of approximately 10,000 pupils in which there is a definitely organized course of study in each subject of instruction except nature-study. When a new teacher comes into this school system she is handed an outline of the work which her class is expected to cover in each subject, except nature-study. A definite place on her daily program is given to nature-study, and she is told that she is to plan her own work for that subject. One teacher of my acquaintance who asked the supervising officer in this school how she would make sure to use the work of preceding grades and at the same time not duplicate effort was told that in nature-study hurtful duplication is not likely, and that there is no need of definite relation of one year's work to that of another year. There can be no doubt that the multiplicity of nature's materials is such, and the impossibility of exhausting a topic in nature is such, that a thoroughly interested and keen teacher may do some good work in such a system as that mentioned above. Could such a statement possibly hold true for other subjects of the curriculum in elementary schools? Suppose in arithmetic, history, language, etc., the teacher's directions are like those given for work in nature-study. We should have a condition of chaos, such as we often now have in work attempted in nature-study.

It may appear to some persons that subjects other than nature-study have become so completely organized that they are formal and unyielding to the vital needs of education in any given school, and there can be no doubt that such conditions sometimes exist. Nature-study must retain its vitality at all costs for if it loses vitality it loses its excuse for existence as a subject of instruction. In this respect nature-study does not differ from other subjects. Neither does it differ from other subjects in the necessity of having a clearly outlined plan of procedure. It needs continuity

of content by means of which teachers may benefit from the many experiences of others who have tried to discover the best use of nature materials in school work.

In the development of nature-study we have now come to the point where more definite courses of instruction must be provided for the use of those who are to teach, and in providing these we shall need to exercise great care in order that on the one hand we do actually provide the teachers with outlines which will assist them, and, on the other hand, outlines which reduce to a minimum the great danger that the subject will be formalized.

Principles of Organization.

It has been shown in a general way by psychologists, and in a more definite way by experiments made by scientists that younger children want to know their nature environment; that they skip quickly from one thing in nature to another asking constantly for names and for much general information about each natural object which catches their attention. These young children are not interested in details and a teacher who tries, as has been done, to use the rabbit as a topic of instruction for two months in a first and second grade group, soon reduces pupils, rabbit, and herself to a condition of impotence.

In intermediate grades pupils want to know more intimate details regarding natural objects—how the river grows from its rivulet source through steep eroded banks, to the great stream with flood plains, and a flow that will support ships; how the garden plants grow through their life round; how insects live through their miraculous stages; how electricity and magnetism work.

In upper grades no previous interest is lost, but a new demand has developed. Nature is no longer merely an embodiment of things, curious and full of wonder, but nature in her relation to man opens a new point of view. Upper grade pupils want to know how animal bodies, particularly the human body works; individual, group, and community hygiene demand attention; the science of the school room, home, and community give the real foundation of prevocational studies.

It is evident that if the above brief statement is sound an organization of a course of study has a good foundation. Many topics, each dealt with briefly, will compose the work of lower grades; fewer topics and more intensive study should be in inter-

mediate grades, and still fewer topics compose the work of the upper grades. The work of each grade is used but not repeated *ad nauseam* in succeeding grades.

Furthermore, most of the phenomena of nature that are available in any locality are available in other related localities and a course may consist chiefly of universal topics. Special features of a given local situation may be included but used in the same way as the more universal material mentioned in the course outline.

A course outline based upon the above plan was published by the writer in the NATURE–STUDY REVIEW for December, 1914.

In organizing a course of study in Nature it must be kept in mind that no education is more fundamental than the training of the senses. The power of observation and proper interpretation of what one observes, the ability to maintain interest in one's environment, always to want to know the truth of nature, and to have studied nature until one has a working belief in the truths of nature, and is willing to order his life in accordance with these truths, these are the ends which the course in the study of nature should secure.

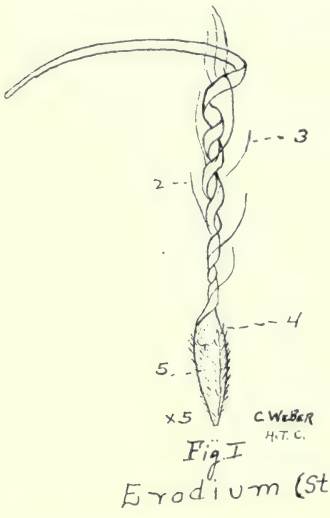


Fig I
Erodium (Storksbill)

A Seed with a Self-planting Device

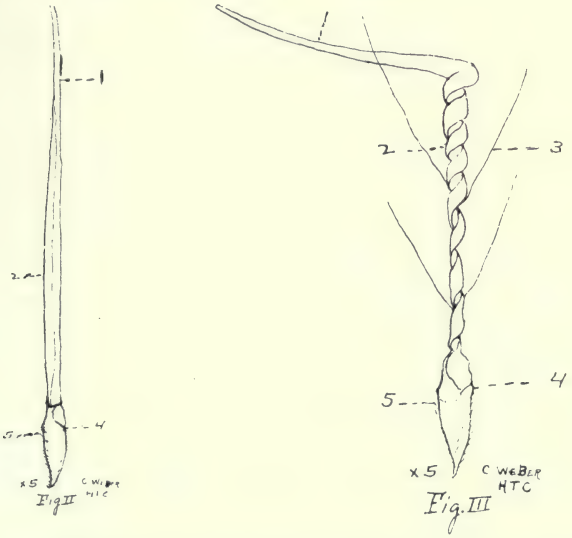
J. A. DRUSHEL

Many seeds have devices by which dispersal is secured. Only a few have the ability to plant themselves (penetrate the soil) by their own power. The seed of erodium (storksbill) illustrates this point. Erodium is differentiated from its close relative geranium (cranesbill) by the spiral twists in the lower half of the style. See figure 1. The upper half of the style is straight and at about right angles to the lower half.

When the seed is moistened the spirals untwist. See figure 2.

Figure 2 shows the result of immersing the seed in figure 1 in water eight minutes. On account of the position of the upper half of the style (1 fig. 1) in the untwisting process the greater force is downward, driving the seed into the soil.

If the seed partly planted becomes dry, the style takes on the



These photographs were reduced three-fifths from pen and ink drawings of the seed x 5. As they stand they are the original x 2.

spiral form. But the barbs on the seed resist the tendency to be pulled out of the soil. Figure 3 shows the effect of exposing the seed in figure 2 to dry air for five minutes.

An experimental planting showed a penetration into ordinary soil to a depth of more than twice the length of the seed in ten days under alternating moist and dry conditions.

Landscape Nature, Photography. II

Earl D. Huntington

Landscape photography is relatively simple in the manipulation of the camera; the tripod can usually be fully extended, which permits the operator to maintain a standing position while focusing and making his exposures; and a long exposure can be given since the distant wind-swayed trees produce only a slight blur in the photograph, and add to its artisticness without detracting from its accuracy.

For general landscape work, a small aperture, i. e., F–16 or U. S. 16, should be used, and a long exposure given; on a bright summer's day, five to ten seconds exposure will give the optimum results with such plates as Cramer's Medium Isochromatics, when hydrochinon developer is to be used. I may repeat that the exposure time recommended for any brand of plates is really the minimum and not the optimum time. Out-of-door photographers, both amateur and professional are speed-mad, and insist on having "fast plates." Action pictures of course necessitate instantaneous exposure, but nearly all nature-photography, excepting highly-specialized work, will admit of long exposure, with which the best results are obtained.

In focusing, the attention should be directed to some object fifty to one hundred yards distant and its image brought into sharp definition on the ground glass with the aperture wide open, unless some definite object is selected specifically as the subject of the picture to which the rest of the landscape will form a setting. In the latter case it is better to use a larger aperture so that the general setting will not appear sharply defined and detract the attention from the specific object.

For the lover of nature, a good landscape picture must not only show certain definite things, but must at the same time be artistic. The pictured swamp or bluff tells its particular story, and the general effect pleases the artistic sense.

After choosing the subject, both the selection of the point from which to take the picture and the choice of the time of day when the light will give the best results requires high art; some people show a natural aptitude along this line, but most of us acquire this faculty only with long experience. However, a few suggestions may be made that will prove of service to the beginner:

Shadows are very important in determining the exactness of the picture as well as its artistic merit. It is well to have the camera so placed that the sun is to one side of it instead of directly behind it in order that the shadows will appear to the sides of the objects in the field of vision.

Movement of objects in the foreground produce relatively great excursions in the image. Therefore, on a windy day, the camera should be set in a sheltered spot, if possible, to avoid any large movement of shrubbery or branches in the immediate foreground.

Fig. 1. Borderline between a swamp and an invading sand dune. Dune Park, Ind., March, 1914. Aperture F-16, time 12 seconds, diffused light.

Any picture with an "open center" is almost certain to be pleasing to the sense of proportion. A valley, stream, lake, meadow, or swamp will give this effect if its borders be included within the limits of the picture.

Border-lines, e. g., between a swamp and forest, afford splendid subjects for artistic and instructive nature photographs, and are usually best photographed from an angle of about forty-five degrees. Perhaps the best rule to follow is to move around the borders of the desired landscape until one finds a spot where

he may exclaim, "What a lovely view," and proceed to make the exposure at once—if the light is favorable.

Ray Filters

Whenever greens, yellows, oranges or red are a prominent part of the subject to be photographed (whether it be a close study or a landscape), or where sand, water or clouds form a conspicuous part of the landscape on a very bright day, the use of a ray filter

Fig. 2. "Blow-out." Note the open center.
Dune Park, Ind., March, 1915. Aperture F-32, time 30 seconds, diffused light.

in front of the lens will add greatly to the correctness of the values in the picture.

White or natural light is a mixture of red, orange, yellow, green blue and violet rays. Until recently, the plates in general use were sensitive to only the blue and violet rays, and the red, orange and yellow objects "took as black;" since green is a "mixed" color, the greens took as black or white, depending on the proportion of yellow to blue in the particular shade. The plates now in use for out-of-door work are sensitive to all the primary colors except red, and are variously known as "isochromatic," or "ortho-

chromatic," and by other trade names. These plates, however, are not equally sensitive to the different primary colors, but are most sensitive to the violets and the blues. A given "ray filter" absorbs definite amounts of these two colors, but transmits the full amount of yellow, orange and red that strike it, and greens, yellows and orange appear in the photograph as grays of proper values, and not as blacks.

These filters are made in different grades, each of which offers a certain amount of resistance to the passage of the blue and

Fig. 3. Swamp and forest. Note direction of shadows of trees. Mineral Springs, Ind., September, 1915. Aperture F·8, time 2 seconds, bright light.

violet rays; they are usually graded so that a No. 1 filter absorbs half of the violets and blues, and so necessitates proportionate increase in the time of exposure; a No. 2 absorbs two-thirds of the blues and violets, and the time of exposure must be tripled; and since a No. 3 absorbs three-fourths of the blues and violets, the exposure must be quadrupled.

The No. 1 filter is the most practical for nature photography since it only requires a doubling of the time of exposure. A No. 2 will give better values if the long exposure it requires can be given.

If a short exposure is given when a ray filter is employed, the resulting negative will be flat.

The price of these filters varies from fifty cents to two dollars depending upon the size and make. It is best to use the particular make of filter recommended by the manufacturers of the particular plate used.

Printing

Any number of prints may be made from a negative after it is once dried. It is placed in a printing frame with image-side

Fig. 4. Desert. Near Seligman, Ariz.
August, 1915. Aperture F-32, time 4 seconds, ray filter, bright light.

up, a sheet of printing paper is laid on so that its emulsion side is in contact with the image-side of the negative, and the back of the printing frame is clamped into place, holding the paper firmly against the negative.

Exposure is best made to an artificial light as sunlight is often very variable The time of exposure will depend upon (a) the intensity of the light, (b) the distance of the printing frame from the light, (c) the thickness of the negative, and (d) the brand of

paper used. Each individual must learn to judge these factors by experience. With a thirty-two candle power light, a "normal" negative, and a distance of two feet, an exposure of thirty seconds would be a good time to start with. Since there is no "normal" negative, the time factor is very variable, and it must usually be judged for each negative separately.

After exposure, the paper is removed from the printing frame and developed with the emulsion side up until the image is nearly of the desired degree of intensity. It is then rinsed in clean water and immersed in a fixing bath, face downward, fixed and washed just as a negative would be. After washing the print is laid face downward on a piece of clean white cloth to dry.

Cyko is probably the best paper for the use of beginners as it develops slowly, and if over-exposed, its development can be checked by transferring the print to the fixing bath; it will produce excellent prints and will stand a great deal of abuse. It is made in a variety of grades, but the "Normal" will serve nearly every purpose. "Normal contrast" is adapted for use with flat or thin negatives, and "Soft" for negatives that are too contrasty.

Azo is a cheap paper that is easy to work with, and which will give fairly good prints.

Velox is probably the best paper made but is very difficult to use since it develops so rapidly that it is practically impossible to check the development of an over-exposed print.

The above, or any other papers, may be purchased in dozen-sheet packages in any size that one's negatives may be. The printing frames are also made in all sizes.

M-Q (metol-quinol) is the most widely used and probably the best developer for prints; it should not be used to develop plates.

Armor Plated Reptile Lived 8,000,000 Years Ago

Dr. Leonard Keene Hirshberg, A.B., M.A., M.D.
(Johns Hopkins University)

Many interesting facts, hitherto un-established, were recently revealed by investigations conducted by the section of fossil reptiles of the United States National Museum concerning the giant fossil reptile known as the stegosaurus, or plated lizard.

It is now known that the two rows of great dermal armor plates along the monster's back alternated like cross-cut saw teeth, and

were not paired; that the largest one was above the base of the tail and not over the hips as previously supposed; that there were only eighteen of these plates; that there were but four sharp spines near the end of its tail; and many other important details relating to the general appearance of this great 15000 pound reptile, which lived about eight million years ago.

In general appearance this early reptile was a monster standing nearly nine feet high at his hips, and measuring about fifteen feet long. It was probably covered with a tough, horn-like hide, reinforced on the top and sides of its head and neck with bony knobs which were in effect not unlike armor plate, or, at least rivet heads. Extending from its small, lizard-like head along

Stegosaurus

its back and well towards its long, tapering tail were great sharp-edged plates arranged alternately in a double row. Its legs and feet were similar to those of the alligators and crocodiles of our age, but the forelegs were much smaller and weaker than the hind ones, due to its heritage from some ancestor which walked on its hind legs. It seems to have possessed little brain and it may have been for this reason that it was so well protected by armor.

In a recent publication written by Charles W. Gilmore, assistant curator of fossil reptiles in the United States National Museum, there were reproduced ten pictures of restorations of the stegosaurus as depicted by various authorities, between the years of 1891 and 1912. Mr. Gilmore has also prepared a model of the

stegosaurus one-twelfth the linear dimensions of the type specimen now on exhibition in the museum, and issued another pamphlet describing same.

Thus protected why should the stegosaurus worry about war or the high cost of living?

Gall Insects and Insect Galls

ROBERT W. HEGNER

Zoological Laboratory, University of Michigan.

Everyone who has spent much time in doing field work with animals or plants has noticed the numerous abnormal enlargements that are present on the stems, twigs, and leaves of many plants. Those who have attempted to find out what is inside these growths have discovered, on cutting them open, that they contained either young or adult insects. The older naturalists did not allow these plant growths, or galls, to escape examination, but in spite of their investigations and the more detailed researches of recent years, there are many things we do not know about them.

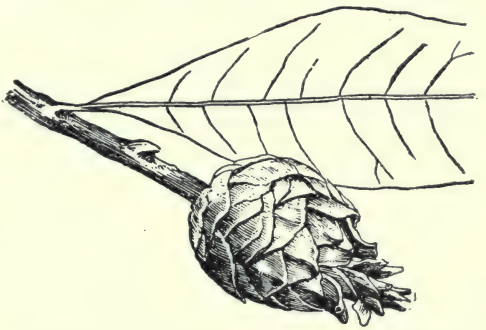


Fig. 1. The Willow-Cone Gall. (After Beutenmüller)

The Willow-Cone Gall

One of the most abundant of the insect galls is the willow-cone gall (Figure 1), a structure that occurs so regularly on certain willows as to be considered by most observers a normal part of the willow plant. The relations between this gall and the insects that inhabit it are among the most remarkable in nature and no better example can be found for the purpose of demonstrating the complexity of the web of life than this common plant growth.

The egg of the willow-cone gall-fly is inserted by the mother into the bud sometime in April or May. What stimulates the plant to produce the gall is not known definitely, but several of the theories that have been advanced will be discussed later. By midsummer

the gall has attained its full growth, reaching a length of about an inch and one-fourth and a diameter of about an inch. There is, however, great variation in the size of the fully developed galls. Dissection of a gall at this time reveals the fact that the bud has produced from sixty to seventy-five scales which overlap in such a way as to form a cone-like structure. In the center of these protecting scales is a cell-like cavity containing the larva that has hatched from the egg laid within the bud, and has lived upon the tissue of the willow. The larva remains in the gall throughout the rest of the summer and all of the next winter. As spring approaches the larva transforms into a pupa and several weeks later emerges as an adult fly which is known to entomologists as Cecidomyia strobiloides.

The life-history of the willow-cone gall-fly is comparatively simple, but the gall that it makes not only lodges and protects its maker, but also serves as a residence for many other insects or their eggs and young. Chief among these are the eggs of the meadow grasshopper. The first scale removed will in many cases, reveal the long, slender eggs of this species. There may be from one to eight or ten eggs resting side by side between the scales with their long axes directed like the long axis of the gall. The behavior of the meadow grasshopper in regard to its choice of a gall in which to lay its eggs is worthy of note, since it seems to prefer blackened, weather-beaten galls, probably because their scales are more easily forced apart. It seems likely that this insect's habit of laying its eggs in the gall is of recent acquisition for in some cases the eggs are poorly placed, even between tightly fitting scales where they are flattened and prevented from developing. From this it would appear that the grasshopper has not learned yet to distinguish the kind of gall best suited to its purpose.

As we proceed toward the interior of the gall, eggs of different sizes and shapes appear among the scales. One investigator found at least thirty-two species of insects inhabiting these galls. Of these, one was the gall-maker; ten were insects, like the meadow grasshopper, that had acquired the habit of laying their eggs in the gall; these we may call inquilines; sixteen were parasites which live upon either the gall-maker itself or upon the inquilines, or hyperparasites which parasitize the parasites; and five were

transient or accidental guests. These species of insects do not emerge from the gall at the same time but become mature one after another over a large part of the spring months.

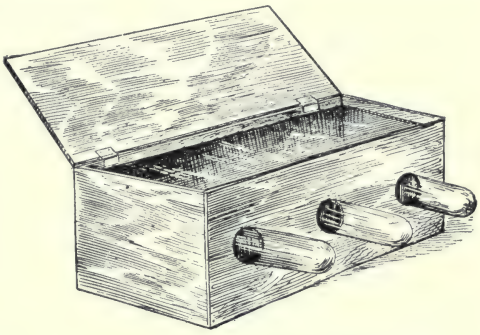


Fig. 2. Breeding cage for rearing parasites and gall insects. (After Banks)

Making a study of willow-cone gall insects is a simple matter. The galls should be collected about the last of March and kept in a covered glass dish where they can be observed easily, or better, may be placed in a breeding box such as is shown in the accompanying illustration (Figure 2). The insects as they emerge will seek the light and will therefore congregate in the glass tubes. These tubes can be withdrawn and their inhabitants liberated or preserved, if desired. If one wishes to determine from which eggs or larva the adults develop, it is of course necessary to isolate them, placing them in separate bottles. A few drops of water sprinkled occasionally over the cones in the breeding cage will prevent the eggs and larvæ from drying.

The Oak Hedgehog Gall

A gall-fly that has a more complex life-history than that forming the willow-cone gall has recently been studied by Triggerson. The gall it makes is known as the oak hedgehog gall (Fig. 3) and

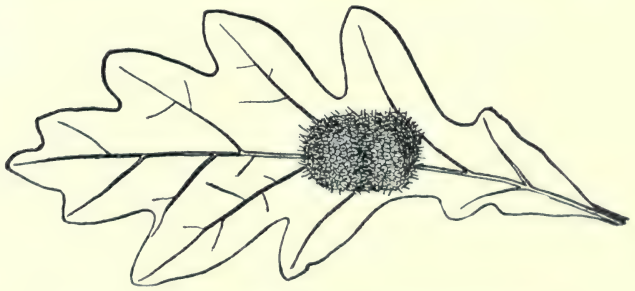


Fig. 3. Oak Hedgehog Gall. (After Beutenmuller)

the gall-fly is named Dryophanta erinacei. This gall is rounded or oblong with the surface netted with fissures, and more or less densely covered with spines. It is usually attached to the midrib but may also occur on the lateral veins and on either side of the leaf. When young it is yellowish-green, but in autumn it becomes yellowish-brown, much lighter in color than the tinting of the leaf. The gall first appears late in June, and reaches full development about the third week in August.

The adult gall-flies of the autumn generation emerge from the gall during the first part of November and fly to the leaf or flower buds of the white oak; here they lay their eggs among the young leaves or flowers. The eggs remain here throughout the winter in a dormant condition undergoing development in the spring. In May the young larvæ hatch and their appearance is soon followed by the growth of thin-walled galls on the scales or terminal part of the leaf and flower buds. Each gall contains a single larva bathed in a watery fluid. These larvæ grow very rapidly and transform into adult gall-flies about the end of May. The gall-flies of this spring generation then lay eggs in the veins of white oak leaves and start the growth of another set of oak hedgehog galls. The life cycle of this gall-fly may be written briefly as follows:

Fig. 4. Oak or May Apple

Large, globular, more or less smooth outside and filled with a spongy substance, in the center of which is a hard woody kernel containing the larval cell. From 1 to 2 in. in diameter. When fresh, it is pale green, soft and succulent, with the contents whitish. Later in the season the shell becomes brown, hard and brittle, with the kernel woody and the spongy substance dark brown, but remaining soft. Confined to the leaves of the trees belonging to the red oak group. (After Beutenmüller).

1. Adults of autumn generation emerge from oak hedgehog gall early in November.

2. These lay eggs in leaf and flower buds of white oak.

3. Early in May these eggs hatch and thin-walled galls are formed on the scales or leaf and flower buds.

4. These young transform into adults of the spring generation the last of May.

5. The gall-flies of this spring generation lay eggs in the veins of white oak leaves.

6. The larvæ that hatch from these eggs cause the formation of oak hedgehog galls, and transform into adults of the autumn generation in November.

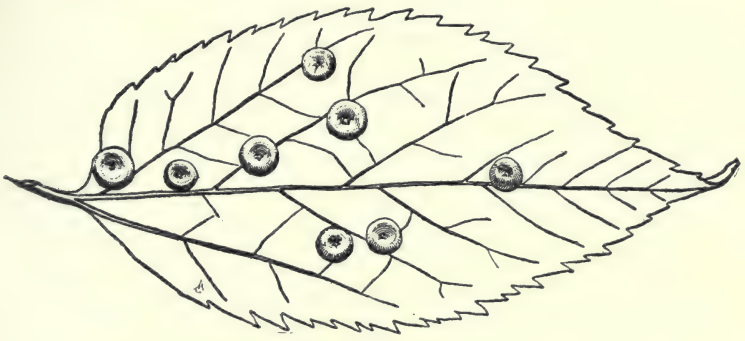


FIG. 5. Huckleberry Melon Gall

Under side rounded, truncated at apex and concave in the middle, with a small nipple. Around the top is usually an acute ridge which surrounds the concave depression, and at the sides near the top are short ribs which are sometimes nearly obliterated. Represented by a cup-shaped impression on upper side of leaf. On under side of leaf of hackleberry. (After Beutenmüller).

The oak hedgehog galls contain not alone the gall-maker but also inquilines and parasites, just as in the willow-cone gall. Nine species of these were found by Triggerson.

Very little is really known about the life-histories of gall insects and there is plenty of opportunity for original investigations in this field. The two described above are sufficient to indicate the various stages a single species may pass through during its yearly cycle, and we may now turn our attention to some more general phases of the subject.

The Forms of Insect Galls

Insect galls are of many different forms and sizes. Some are regular and spherical, with smooth surfaces (Figure 4); others are very much misshapen, with hard, woody, horn-like protuberances through which the imprisoned insects escape. The larger number of leaf galls are mere "warts" or excrescences, some

being pointed and others variously sculptured and colored. (Figures 5, 6, 7, 8,).

Twig and bud galls are generally globular in form or approximately so. They are sometimes singly placed, but very often occur in grapelike clusters. The oak fig gall consists of several individual galls grouped in a tightly fitting mass; the willow or potato gall looks very much like an old dried up specimen of the potato, and the blackberry seed gall is easily mistaken for a cluster of woody seeds.

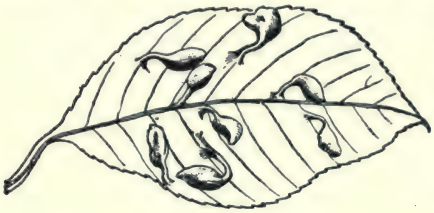


FIG. 6. Wild Cherry Pouch Gall.
Stem-like, expanding at the end into a pouch-like sack. About two-fifths in. long. Hollow, with an exit on under side of leaf. Green or red. In numbers on leaf of wild cherry. (After Beutenmüller).

Classification of Insect Galls

The classification of galls is rather difficult and four methods that have been suggested are here given.

I. Simple and Compound Galls.

1. Simple galls: those galls that are limited to a single plant organ.

FIG. 7. Maple Spot Gall.
Eye-like, circular, flat. Light yellow, with a red central dot, or entirely green or yellow. In numbers on the leaves of red maple. (After Beutenmüller).

a. Felt galls: simple galls due to the growing out of hairy coverings of various sorts. The majority of these are caused by mites.

b. Mantle galls: hollow, simple galls with a lining of a portion of the surface of the affected organ, and in many cases an open communication.

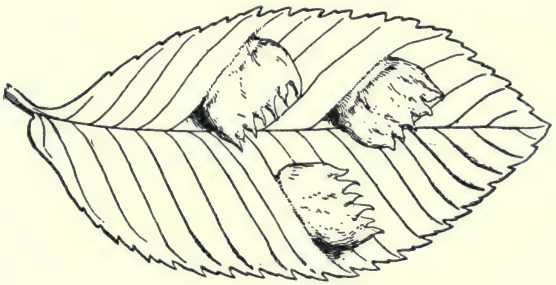


Fig. 8. Cock's Comb Elm Gall.

Forms a cock's comb, blubber-like growth on the upper side of the elm. (After Beutenmüller).

Fig. 9. Goldenrod Gall.

Consists of a small bunch of accumulated aborted leaves, one-half to three-fourths inches long. Caused by the arrest of the side branches. Inside, at the base, is a hollow space in which the larva lives. On stalk of goldenrod. Singly or in numbers. (After Beutenmüller).

c. Solid galls: simple galls formed by eggs deposited on the surface and not within the tissue. These differ from the mantle galls in that there is no cavity or opening; the adult gall-insect must, therefore, bore its way out.

2. Compound galls: those galls in the production of which several plant organs are concerned.

II. Root, Stem, Leaf, and Flower Galls.

1. Root galls: those situated upon or within the roots.

2. Stem galls: those situated upon or within the main stem, the branches or the suckers.

3. Leaf galls: those situated upon or within or enclosed by the blade, the petiole, the stipules, the bract, or the scales.

4. Flower galls: those situated upon or within or enclosed by the calyx, the corolla, the catkin or the subsequent fruit or seed.

III. Unilarval, Multilarval, and Multinymphal galls.

1. Unilarval galls: those possessing but one larva.

2. Multilarval galls: those possessing more than one larva.

3. Multinymphal galls: those in which the young insects are nymphs, such as the plant lice.

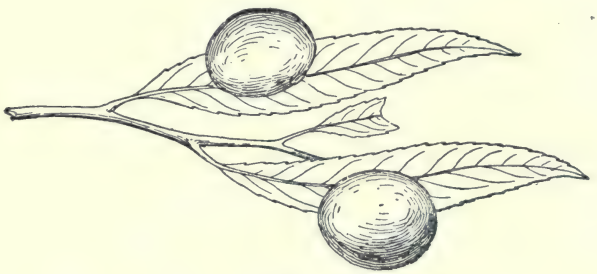


Fig. 10. Willow Apple Gall

Rounded and fleshy, somewhat resembling a miniature apple. Yellowish green, usually with a rosy cheek. Measures about one-half inch in diameter. On leaves of bush willow. (After Beutenmüller).

IV. Galls Produced by Mouth Parts or by Oviposition.

1. Galls produced by mouth parts.

2. Galls produced by oviposition (the egg-laying apparatus).

The method of classification that seems to be most in vogue at the present time is number II above. Galls may also be classified according to the agent causing them,—a subject that will be discussed later.

The Structure of Insect Galls

The structure of insect galls varies to a great degree. The simplest galls have thin walls upon which the larvæ feed until a mere shell is left. When they have reached their full growth the larvæ

leave the galls and pupate in the ground. The more complex galls have a wall of several layers and a central cavity, called the kernel, in which the larvæ pupate. There may be several kernels in a single gall. The adult gall-flies that develop in this type of gall have powerful jaws by means of which they gnaw their way out.

Many of the galls produced by mites are of the simplest type. As a rule the gall is on the upper surface of a leaf with an opening on the lower surface. The very simplest type is merely an abnormal growth of hairs on the surface of the plant, among which the mites live. The most common type of mite gall is formed by an infolding of the leaf caused by an unequal growth of the tissues, thus forming a cavity, simple or branched, which is lined with numerous hairs. In most cases several zones can be recognized in a gall; an inner nutritive zone rich in protoplasm and an outer protective zone which is thick-walled and contains less protoplasm, but is provided with a considerable amount of tannin.

The galls produced by the true bugs (Hemiptera) range from a very simple leaf curl to structures that are very complex. The galls caused by certain plant lice are especially interesting because the tissues of the affected region grow around and enclose the insect. The insect establishes itself on a leaf or stem and draws nourishment from the plant, causing the cells in this region to shrink somewhat, while the adjacent cells are stimulated to excessive growth. Thus the tissues gradually bend over the insect and almost completely enclose it.

For accounts of the stucture and formation of the more complex types of galls the reader must be referred to the detailed descriptions given in the books listed at the end of this article.

The Protection of the Larva

One of the principal benefits derived by the gall insect from the gall is the protection of its young, the larvæ and pupæ. Among the agents from which gall insects need protection are weather conditions, insectivorous birds and mammals, and parasitic insects. The outer covering of the gall, which is of several layers, forms a protection from mechanical injury, and this is sometimes added to by the formation of an inner shell. Some galls are covered by imbricated scales, as in the willow-cone gall, thus pro-

tecting the young not only from parasites but also from extremes of temperature and moisture.

Many gall insects secrete a sweet, sticky substance which is particularly attractive to ants. The latter act as sentinels to guard the gall insects from parasites.

The general distastefulness of galls probably also protects them from many animals that would otherwise be their enemies. This is due either to the large amount of tannin in the tissues of the gall or to the emission by the larva of a disagreeable odor.

Agents Concerned in the Production of Galls.

The extent to which plants are infested with galls may be realized when a list is made of those found upon a single species or groups of species. The oaks, for example, are visited by a large number of different species of gall insects. Thompson in his recent paper on American insect galls lists several hundred on this group of trees. They occur on the roots; attached to twigs and branches; or within the twigs and branches and on the leaf buds, leaves, aments, and fruit.

The producers of galls belong to five different orders of insects and to several families under each order, as follows:

I. Order Hemiptera—True bugs.
   1. Family Aphididæ—Plant lice. (Figure 8).
   2. Family Psyllidæ—Jumping plant lice (Figure 5).
   3. Family Coccidæ—Scale insects.

II. Order Diptera—True flies.
   1. Family Cecidomyidæ—Gall gnats (Figure 1).
   2. Family Trypetidæ—Trypetid gall-flies (Figure 9).
   3. Family Mycetophilidæ—Fungus gnats (Figure 7).

III. Order Coleoptera—Beetles.
   1. Family Buprestidæ—Metallic wood borers.

IV. Order Lepidoptera—Butterflies and moths.
   1. Family Gelechidæ—Gall moths.

V. Hymenoptera—Ants, bees, wasps, etc.
   1. Family Cynipidæ—Hymenopterous gall flies (Figure 4).
   2. Family Tenthredinidæ—Saw flies (Figure 10).

Besides the groups of insects listed above, certain of the mites (Class Arachnida) produce galls (Figure 6) and eelworms (An-

guillula) and fungi are also responsible for the development of structures called galls.

The Causes of Gall Formation

One of the most difficult problems connected with the study of insect galls concerns the causes of gall formation. What stimulus causes the plant cells to increase in number and to form a certain sort of gall for each species of insect? Some of the suggestions that have been offered fall under the following categories:

1. The stimulus is mechanical.
2. The stimulus is chemical.
3. The parent provides the stimulus.
4. The offspring provides the stimulus.
5. Combinations of the above.

Many writers have been inclined to think that a poison is introduced into the plant tissue by the insect when the egg is deposited and that this poison stimulates growth. This may be true for the galls that are made by certain species, especially by the saw flies, for it has been observed by several that these galls develop before the larva hatches from the egg. Many of the Cynipidæ have been observed to secrete a liquid at the time of depositing the egg, but this does not seem to stimulate gall formations because there is no increase in the number of plant cells until the larva appears.

If the stimulus is not a chemical one provided by the parent, then perhaps it may result from the mechanical injury resulting from the egg laying process. Here again the facts point to the conclusion that it is not the parent but the offspring that initiates the development of the gall.

When the larva hatches from the egg it begins to feed upon the plant tissues, a process that is accompanied by either mechanical or chemical activities or by both of these. The mechanical irritation set up by the larva may be the cause of gall formation, but in at least some thoroughly studied cases chemical substances produced by the larva provide the stimulus that causes the rapid increase in the number of plant cells. Triggerson, for example, concludes after careful observations and experiments of the oak hedgehog gall that a secretion from the excretory

organs(Malpighian tubules) of the larva is the primary cause of the development of this gall. Secretions from other parts of the body may also have an influence.

In conclusion, it may be said, that gall insects and insect galls furnish a fascinating field for study, especially since there is still so much of interest and of importance that is not known about them.

Literature List

The following titles have been selected from the hundreds of papers that have been published on this subject.

1. Adler, H. and Straton, C. R. 1894. Alternating Generations, A Biological Study of Oak Galls and Gall Flies.

2. Beutenmüller, W. 1904. The Insect Galls of the Vicinity of New York City. *American Museum Journal*, vol. 4.

3. Cannon, W. A. 1900. The Gall of the Monterey Pine. *American Naturalist*, vol. 34.

4. Connold, E. T. 1902. British Vegetable Galls.

5. Cook, M. T. 1902–1904 Galls and Insects Producing Them. *Ohio Naturalist*, vol. 2, 1902; vol. 3, 1903; vol. 4, 1904.

6. Cook, M. T. 1902–1904. Preliminary List of Gall-Producing Insects Common to Indiana. *Proceedings of the Indiana Academy of Science*, 1902–1904.

7. Cook, M. T. 1910. The Insect Galls of Michigan *Michigan Geological and Biological Survey*. Publication 1. Biological Series 1.

8. Felt, E. P. 1096. Insects Affecting Park and Woodland Trees. New York State Museum, *Memoir* 8. Vol. II.

9. Heindel, R. L. 1905. Ecology of the Willow-Cone Gall. *American Naturalist*, vol. 39.

10. Küster, E. 1911. Die Gallen der Pflanzen.

11. Packard, A. S. 1890. Insects Injurious to Forest and Shade Trees. *Fifth Report of the U. S Entomological Commission.*

12. Thompson, M. T. 1915. An Illustrated Catalogue of American Insect Galls.

13. Triggerson, C. J. 1914. A Study of Dryophanta Erinacei and its Gall. *Annals of the Entomological Society of America*, vol. 7.

A Graded Course of Garden Work and Nature-Study

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Much school-garden work has been too "hit or miss," too "rule of thumb," too much alike in all grades. Much nature-study, beside being open to the last objection, has been allowed to evaporate in sentiment because not tied to the doing of worth-while things in a way adapted to bringing worth while results.

Once upon a time a school-garden instructor approached a little girl who was holding up her empty seed packets and exclaiming with satisfaction "They're all planted!" "What's planted?" asked the teacher. "O," said the child, looking over the packages, "radish and cucumber and lettuce and beets and corn and nasturtiums and tomatoes and morning glory"—and so on. "Where?" said the teacher. "O, there!" pointing to the little "bed", two by four, carefully raised almost a foot above the paths on which the child had lavished more pains than on the planting, "they're all in there!"

That was in the early days when gardening zeal "spilled over" on the soil in the springtime, as sap from the maple trees, and then simmered away in the summer sun leaving thicker and thicker the crop of—weeds. Why? Because the garden guidance and the accompanying nature-study course, if there was any, was too much like the little girl's garden, or like the carpenter's bench above which hung the motto, "A place for everything and everything in it."

Perhaps what is needed is not less sentiment but more sense and more system, the kind of system which makes much of the nature-study prepare for and grow out of "doing things" in "contact with Mother Earth." With Hodge, I believe that thus, in the care and study of pets, in animal industry, and in gardening "at last nature-study has come to its own."

The course which follows is an attempt so to grade the garden lessons and to correlate the nature-study that each may help the other to educate the children through activities suited to their capacities and interests at different ages. It was worked out, jointly with Mr. Roy L. Smith, at the Massachusetts State Normal School at North Adams, used in part at the Mark Hopkins Training School, and revised since by the writer.

More than five hundred children in all the grades from the kindergarten to the ninth have a share in the school-garden of three acres near the school. In the first four grades the children have class or group plots; in the fifth and sixth, individual plots; in the seventh, eighth, and ninth grades the work is more optional and increasingly commercial or intensive ("prevocational"), larger areas being assigned to single applicants or to groups, for the growing usually of one crop. As a rule these are pupils who have no land at home. Many of the children, however, have home gardens and the school gardens are used for learning gardening methods and as a laboratory for nature-study and for growing nature-study material (and thus for growing children).

Much emphasis is laid upon summer supervision both of the school and the home plots. A detailed score-card is used to report on the latter, prizes being offered for the best work. The school garden is open twice a week for children to care for their plots. Those who do not come lose a proportionate part of the crop.

The land for these gardens was formerly in part a dumping place and was improved by aid of and for use of the children. In 1913 the school was awarded first prize for the "best home and school gardens under the direction of a single school" in the state.

Following is the list of plants recommended for the different grades:

For home gardens use plants previously grown at school if possible; or, directions may be given at school just before the home planting.

GRADE 1—Bush beans and pop corn or sweet corn. Nasturtium and sunflower. Bulbs (paper white narcissus).

GRADE 2—Radish and lettuce (curled). Zinnia and sweet alyssum, or morning-glory. Set out tomatoes or cosmos.

GRADE 3—Beets and head lettuce, mignonette and phlox (Drummond's) or pot marigold. Set out Cobœa (cup and saucer vine) or pansy or geraniums.

GRADE 4—Carrots or Swiss chard and onion sets; or, other bulbs. Balsam, asters, stocks, or dianthus (pinks). Or, grasses, clovers and grains (cereals) sown broadcast; or seeding a lawn or school yard.

GRADE 5—Cosmos or cobœa (starting indoors). Also tomato or cabbage, starting indoors. Outdoors: bachelor's button, tur-

nips or kohlrabi (or cabbage started indoors) succeeding radish or lettuce.

GRADE 6—Snapdragon or petunia (starting indoors). Verbena and California poppy or true poppies. Gladiolus bulbs or dahlias started in spring, or hardy bulbs in the fall. House plants (as geranium, begonia) started from cuttings in fall or winter. Squashes and corn or potatoes, with fertilizer tests, spraying, etc.

GRADES 7–9—Choice of any of the preceding or of other plants. Work by selected groups or individuals with commercial gardens (larger areas, club contests, etc.), experimental plots, decorating of grounds, planting herbaceous perennials, shrubbery, trees, etc.

In any grade plants grown before may be chosen again.

In ungraded schools or where gardening must be limited to a smaller number of grades or plants, the following (somewhat in order of difficulty of growing them) are recommended:

VEGETABLES: radish, lettuce, beets, cereals, grasses, clover corn, potatoes, cabbage, tomatoes, squash or cucumber.

FLOWERS: nasturtium, alyssum, morning glory, zinnia, phlox, balsam, pinks, asters, cosmos, petunia, or snapdragon; bulbs in any grade; cuttings in middle or higher grades.

OUTLINE OF THE COURSE

GRADE I. CONTINUED IN GRADE II

(See for each Grade, leaflet "Plants Recommended for Children's Gardens")

Teachers to be provided with the leaflets referred to. These mention additional sources of information, etc.

Garden Trips (in fall)

Teacher conducts children to gardens.

Teaches to recognize and name common vegetables and flowers (at least those to be planted the next spring), such as corn, beans, tomato, squash, sunflower, nasturtium, etc ; also common trees, as elm, maple, pine, apple.

Open friuts and find seeds inside (squash, beans, apples, etc.)

Harvesting

Teach the children how to pick flowers.

Children observe and learn to help if possible in harvesting and storing vegetables and fruits. Kinds of food from gardens and fields for people and other animals. Connect with Thanksgiving.

Food stored for winter in barns, cellars, corn cribs, etc.

Seasonal changes. Effect of frost. Preparation for winter (plants, animals, man).

Bulbs (October or November)

Teacher plants bulbs in stones or water (paper white narcissus). The children observe the process.

Children watch the bulbs grow and talk about them. The teacher answers their questions, directs observation, and names the parts of the plant.

Seeds (early spring)

Children or teacher brings to the class room several of the larger common seeds, e.g., corn, squash, beans, radish, sunflower, etc.

Children talk about them. Teacher directs observation of form, color, size, markings, etc.

Children learn to recognize and name the seeds.

Germination

Teacher, in presence of the children, places a few squash or bean seeds in moist cotton, sand, or blotting paper in a glass jar. Cover.

Children watch these seeds develop into little plants.

Recognition by the children of root, stem, and leaves.

(The children can pot and later transplant into garden, if desired.)

Garden

Making the bed.

Children imitate and follow directions in assisting the teacher in preparing the class plot, raking, lining, marking, etc.

Planting (seeds of bush beans, pop-corn, nasturtiums, sunflower).

The teacher plants each kind of seed in turn (one kind at a lesson) describing accurately as she plants, in order that the children may understand the directions given later.

Teacher gives specific directions as to where, when and how to plant each seed. Children follow directions and imitate the teacher's way of planting or transplanting.

Growth

Children observe very frequently the growth of plants in the garden, without and with instructions.

Recognition of each plant.

Teacher encourages them to ask questions and to talk about what they see.

Cultivation

Teacher shows children how to use rake and hoe to keep soil loose between plants. Children assist in the cultivation.

Animals

If any insects, toads, birds, earthworms, etc., are observed in the garden by the children the teacher satisfies their curiosity concerning them.

Harvesting (June)

Teach the children how to pick flowers and how to harvest vegetables.

GRADE II (See Grade I)

Harvesting

Teacher shows the children how to pick flowers and how to harvest vegetables from Grade I garden; also (in June) from Grade II garden.

Use some for indoor decoration, drawing, coloring, etc.

Bulbs (October or November)

Teacher plants bulbs in pots of soil (tulips, crocuses) to be put in a cool place for rooting. When brought out (January) the children watch them grow and talk about them, the teacher answering any questions. (See leaflets on Bulb Planting.)

The teacher gives definite instruction in distinguishing and naming the kinds—tulip, crocus, etc., as they develop. Children recognize and name the parts, root, stem, leaves, flowers.

Seeds (early spring)

The seeds learned in Grade I are reviewed. Children should learn to recognize and name new seeds planted in their garden (as radish, curled lettuce, zinnia, sweet alyssum).

Germination

Children start (test) some of the vegetable seeds in cloths between plates. If desired a few can be grown and transplanted into the garden later. Encourage watching and talking about the seedlings. The teacher guides the children in discovering the differences in the growth of various seeds.

Conditions of Plant Growth

From bulbs, seedlings, or plants in the room the teacher leads children to understand that plants need light, heat, moisture, soil, air. (Can you make clear this last?)

Garden Soil

Children observe the soil in various plots, and distinguish fine and coarse, light and dark. Which better?

Preparing Plot

Children assist the teacher in preparing the class plot, raking, measuring, lining, marking, etc.

Planting

The teacher gives specific instruction in the use of all tools handled and while planting each kind of seed,—how far apart to make the rows, how far apart to plant the seeds, and how deep to cover them (See Planting Tables). Children imitate.

Transplanting

The teacher in the presence of the children transplants tomatoes, cosmos, or other plants chosen, shows and describes each step. Children imitate.

Growth

Children observe very frequently the growth of the plants in the garden. Teacher directs personally the observation of all children to some things, of some children to more things.

Teacher encourages them to ask questions and to talk about what they see.

Cultivation

Teacher shows children how to use rake and how to keep soil loose between plants. Children assist in cultivation.

Animals

If any insects, toad, birds, earthworms, etc., are observed in the garden by the children the teacher satisfies their curiosity concerning them.

GRADE III

Garden Trips (in fall and in June)

The teacher conducts groups of children to gardens, especially those planted by Grades II and III the previous spring.

Recognize and name the plants. Later write lists and learn the spelling.

Changes (growth, etc.) during summer and fall.

Relative success of different plants—probable reasons.

Teach to pick and arrange flowers.

Find flowers changing to fruits ("going to seed"). A few seeds may be gathered and saved for spring planting. Plants bloom longer if flowers are picked. Why?

Harvesting and apportioning the vegetables, computing their value, etc. should furnish number problems.

Cuttings (September)

The teacher shows the children how to make cuttings of geranium and put them in water to root. Have children who can, bring branches from plants at home from which to make cuttings If possible give each child one cutting to care for at home. When rooted (four weeks or more), teacher shows how to pot them in soil (Children bring pots or cans from home) and then continue to care for them at home or school (See leaflets on Green-wood Cuttings).

Omit bulbs in this grade if cuttings are studied.

Bulbs (October or November). See above.

Seeds (early spring). See Grade II and list for Grade III

Recognition of all seeds learned in Grades I and II.

Children make a collection of seeds planted so far. These may be in small glass bottles, labeled, and placed where the children frequently see them.

Children learn to recognize the new seeds planted in this grade.

Germination

Children test as in Grade II at least one kind of seed to be planted.

Teacher has them note accurately the number tested, how many start strong and quickly, how many weak and slowly, how many do not start.

Children draw conclusions about the worth of the seed (See Nature Leaflet 37, Mass State Board of Agriculture, on Seed Testing).

Conditions of Plant Growth

From bulbs, seedlings or house plants in the room lead children to recognize that plants need light, moisture, soil, air. (See leaflets. Experiments with Plants and Soils. Do at least exps. 6 and 7 in this grade).

Garden Soil

Have children learn to recognize in the garden or elsewhere gravel, sand, clay, woods-soil (humus), and loam (a mixture of the others).

Using the garden, or dry samples of these soils brought into school room, let pupils experiment how readily water passes through each. (Fill a jar half full of each, then pour on water slowly. Conclusions?)

Have each pupil note carefully the kind of soil in his own plot.

Plan

The teacher works out the plan of their garden with the children, leading them to consider arrangement, spacing, etc.

When plan is worked out have a copy placed where the children may see it. Have them refer to it constantly in planting the garden. May not the children copy the plan? This will call for training in number as well as drawing.

Preparing the Class or Group Plot

Children assist the teacher in preparing the plot, raking, measuring, lining, marking, etc.

Planting. Transplanting

The teacher gives specific directions for use of all tools handled and for planting each kind of seed. Show them how far apart to make the rows, how far apart to plant the seeds, and how deep to cover them (Planting Tables).

Transplanting (See "Starting Seeds Indoors," second leaflet).

Teacher shows and tells definitely how to transplant the geraniums, pansies, or other plants chosen. Children imitate.

Cultivation, Care, Etc.

Hold the children responsible for the care of their garden (or each for a part).

Show them why we "thin out" young plants and how to do it.

Talk with the children about weeds and why they must be kept out (The weed is a robber. He takes moisture, light, food).

Interest the children in their plants as living things that need their care.

Teach them to till the soil between the plants and keep it loose at top and free from weeds. Why?

Do not let children pull soil up about the stems of plants. Teach that this lets soil dry out more and may injure roots.

Teach children to recognize the insect enemies discovered on their plants. Talk with them about these pests and the remedies.

Lead them to discover interesting facts about the plants, as they grow.

Talk with them about the uses of their plants.

GRADE IV

Garden Trips as in Grade III

Continue the insect work begun in the spring.

Observe bees visiting flowers. What do they get? (Nectar, pollen—use?)

Bring caterpillars on plants to cages in school room. Watch their habits and development. Damage done. Remedies.

Teach to pot geraniums from the garden.

Bulbs (October or November)

Pupils plant bulbs (narcissus, hyacinth) in pots (group-work). Interest them in potting and caring for bulbs at home.

Children watch growth of plants in the room.

Recognition of kinds.

Compare bulb flowers with apple-blossoms (Spring). Parts, uses.

Seeds (early Spring)

Germination of peas and corn. Contrast with squash and bean. Parts in each seed (See leaflets, Study of Seeds and Seedlings).

Soil

Review kinds of soil, water in soil of each kind.

Make a soil map of part of the garden where 4th grade plots are located.

Discover and study briefly top soil and sub-soil. (See soil and mineral leaflets.) Distribution of roots in soil. (Observe in holes dug in garden.)

Home Gardens

Encourage the children to start gardens at home. Help in planning, getting seed, etc. (See Planting Plans, Seed Order lists.)

School Garden

Grains and Grasses.

Recognition of each kind sown. (The teacher is to have a collection of each kind in glass vials, labeled.)

Uses and importance of each. Kinds for lawns, pasture, etc.

Testing seeds, methods and importance.

Garden plan—when finished keep plan posted where all may see.

Each child should copy this and also make a plan of his home garden.

Sowing grains. Preparation of soil, covering, etc.

Have the children watch the growing grains and grasses.

Lead them to tell how they can distinguish the different kinds.

Teach them to observe differences in stalk, leaf, grain.

Talk with them about the peculiarities of each kind.

Consider such adaptations as the folding together of the clover leaves at night, the curling of the corn leaves in drought, the drooping of the grain heads, etc.

Recognition of weeds in plots.

Recognition of insect enemies found among the growing grains.

Answer questions about the bees found on the clover and buckwheat blossoms. Their help in seed production.

In a general way show why clover, alfalfa, soy beans and cow-peas enrich the land.

GRADE V

Review recognition of growing grains and grasses (See Grade IV).

Harvesting and threshing. Special study of corn.

Grain produced by different people of the world (Geography). Uses.

Continue insect work of Grade IV. Apply knowledge gained to combating such pests as cabbage caterpillar, tent-caterpillar, etc.

Value of birds in the garden. Bird houses, etc.

Bulbs or Cuttings (See Grade III)

Recognition of various kinds of bulbs; potting bulbs, growing bulbs indoors, outdoors (Leaflets on Bulb Planting).

Seeds

Recognition of all seeds planted in previous grades and any new ones chosen this year.

What is a seed? Discuss briefly.

Test seeds to be planted.

Seed selection.

What is necessary for germination of seeds? (Heat, moisture, air. Why? Why not soil and light? See experiments under the next topic.)

Seeds, roots, leaves,—relation to air and light.

See leaflets, Experiments with Plants and Soils. Have children help in doing experiments 9, 10, and 1. See also experiments 2 to 5.

Soil

Collection of various soils from the garden or elsewhere.

Experiment to show rise of water in different soils (No. 11, Experiments with Plants and Soils).

Children make a careful study of soil in their own plots, at school and home, and how to improve it.

School Garden

Indoors.

Starting seeds in flats (tomato or cabbage, cosmos or coboea, asters, etc.) (See leaflets, "Starting Seeds Indoors.")

Pricking out seedlings.

Transplanting from one pot or box to a larger one.

Direct the children in the use of the hot bed, the cold frame.

Definite class work on planning the plots. Each child keeps a plan of his own garden plot. Teach use of radish, lettuce, etc., with corn, tomato, cabbage, turnip, etc., for succession.

Outdoors—Individual plots.

Hold the children responsible for preparing the soil, measuring and marking the plots and sowing the seeds. (Be sure that they handle all tools properly and that they work intelligently and accurately.)

Home Gardens. Encourage the children to have similar gardens at home. (See Grade IV).

Tillage

Teach why we till and when it should be done. (Do experiment with lumps of sugar, No 13, Experiments with Plants and Soils).

Lead the children to recognize and remove the common weeds found growing in their plots.

Hold the children responsible for intelligent thinning out, weeding, and cultivating. Reasons. Inspire them with a desire to have the best garden.

Study of Plants

Lead children to see the individuality and peculiar habits of each kind of plant under their care. Where are the flowers produced? Note the different parts of the flower. Uses. Watch closely the development of flower into fruit. How does the plant adapt itself to the storage of food and to seed production and dispersal?

What part of the plant do we use for food? Why? Of what use to the plant?

Have the pupils make drawings to illustrate the various adaptations of the plants.

Correlate with the work in arithmetic, geography, spelling, art, etc.

GRADE VI

Review recognition of growing grains and grasses.

Correlate study of garden crops with review in geography on "Peoples of the World."

Teach the children how to harvest the products grown in Grade V

Show the children how to prepare their flowers and crops for exhibition or for market.

Question to get children to investigate why some people get better prices for products than others.

Study seed dispersal, if observed.

Teach what to do with the refuse of the plants and why we compost.

How to prepare soil for pots or window boxes.

Cuttings (see previous grades); or,

Bulbs. Teach to plant, care for, and force

By use of spent bulbs of narcissus, crocus, etc., teach their structure. Differences. Advantage of bulb-plants over others. Find new bulbs forming. (See leaflets for Study of Bulbs).

Seeds

Review work of Grade IV with large, typical seeds in different stages of germination. Show that a seed contains a little plant; why seeds are borne; what use we make of seeds; why.

Seed testing and seed selection. Why exercise care in ordering seeds?

Review experiments of Grade V.

Soil and Soil Water

Review the work of Grade V.

Experiments to show capillarity and the effect of a mulch. (Nos. 12 and 14).

Show how tilling affects the soil.

How water is taken in by roots and forced up in stems (Experiment 8. Recall Experiment 7).

Experiment to show the relative capacity of different soils for taking in and holding moisture (No. 15, Experiments with Plants and Soils). Connect with plowing and harrowing. Apply also in explaining the value of humus in fields and forests.

Fertilizers

The need for returning plant food to the soil; manure, compost, artificial fertilizers, if any are used. Proper treatment of manure to prevent breeding of flies, also its deterioration.

Gardens

As in Grade V at school and at home. Start small seeds, as petunia, snapdragon, in flats (See leaflets, "Starting Seeds Indoors").

Flowers

Direct pupils' observation in trying to show,—which of the plants bear flowers, the parts of typical flowers; the use of each part; fertilization and reproduction; why plants bloom. How bees, etc., help the flowers.

Trees

Recognition and *uses* of common trees. Effect in a garden.

Planting trees (Arbor Day).

GRADE VII

Plant Study

Adaptations of plants (note all possible).

Drawings of most interesting features.

Uses and adaptations of roots, stalk, leaves, blossom, fruit, seed. Study especially squash, nasturtium, corn and apple.

Dispersal of seeds (including weed seeds) as illustrated in gardens.

Harvesting

Children held to proper methods of harvesting.

Teach children how to prepare products for market and for exhibition purposes (See Grade VI).

Scoring

Determine what products are the best of their kind.

Why are they best? How is good seed selected?

Composting

Teach how to compost, and its importance.

Bulbs, Perennials

Review work on bulbs. Teach to plant bulbs outdoors; also herbaceous perennials, shrubs, and trees; or, small fruits.

Seeds

Review work on seeds.

Test all kinds sown. Vitality, purity.

Treatment of seed for disease; also potatoes before planting.

Soil

Review what was learned in Grade VI.

Soil map (top soil) of whole garden, or of a farm.

Qualities of top soil and sub-soil—how improved.

Plowing—fall, spring,—advantages.

Fertilizers

Review Grade VI.

Study of composition of artificial fertilizers.

How to use fertilizers. Trial plots or rows.

Crop

(Commercial plots—larger units if possible. Club work.)

Intensive study of the crop chosen by pupil. (May include small fruits, or a lawn or herbaceous perennials, shrubs, etc., for decorating grounds.)

Seed selections.

Growing season required.

Conditions of soil for best growth.
Preparation, planting.
Cultivation—how to conserve the moisture.
Insect enemies—methods of work. How to destroy them. Diseases—how avoided.
Harvesting the crop. Marketing.
Scoring.
Canning and preserving. Storing.

Composition of plants Food of Plants

Recall or repeat experiments 1 to 5 (See Grade V).
Experiment 21, Practical Science (heating organic matter in a test-tube—with limited air supply). Apply also in explaining the origin of humus, of peat, and of coal.

GRADE VIII

Club work on larger areas at school or home. Canning clubs.
Like Grade VII with additional work on
Crop rotation; or, fruit trees and poultry.
Seed selection.
Commercial value of crops.
Insecticides—preparation, use.
Scoring of vegetables, etc.

GRADE IX

Work in Grades VII and VIII should be continued and extended in this grade and in the High School. Also:
Farm animals.
Simple soil testing—for acidity, need of lime.
Tilling, irrigation, drainage.
Testing and mixing of fertilizers. Interpretation of analyses.
Improvement of land.
subsoil plowing.
legumes, bacteria, green manure.
Commercial areas of the world.
Possibilities of agriculture in the state and the region.

School Room Experiences with the Cecropia Moth

Josephine Bailey

Our first acquaintance with the cecropia was formed last fall when one of the fifth grade girls brought me an immense cecropia caterpillar. It was taken to school and in a day or two began to spin. It spun on the side of the cage in which we kept it, and here it remained until the next spring, when it emerged, a fine, large moth.

Then in the spring, while on our nature-study trips, we succeeded in collecting nine other cecropia cocoons. We found them on hedge, box elder, lilac, cherry, and plum trees. Four of them had been parasitized. We noticed a small hole in the cocoons which looked as though they had been poked with a small pointed stick. Some insect had punctured them; laid its eggs; and the larva which hatched from these eggs had fed on the living form inside of the cocoon, then changed into its adult form and flown out into the world.

One child brought to school a cocoon which had been carefully opened without destroying the case inside; and the children at school were much interested when, upon examining it, they found that the pupa was alive. They enjoyed watching it, for whenever disturbed it moved from side to side, showing the breathing pores and abdominal segments. It is oval in shape; much shorter than the worm; and is smooth and brown. They also noticed the outline of the wings and the antennæ folded over the body. Besides the pupa case they found, inside the cocoon away down at the lower end, the old, cast off skin of the caterpillar. For after he has finished his cocoon he must shed his skin before changing into a pupa.

The six perfect cocoons were taken into the school room and placed in insect cages. We moistened them once or twice every week, for if the cocoon is allowed to become dry the moth can not work its way out in the spring. The moth does not eat, but the larva does and the moth lays her eggs after the trees are in leaf.

In May the first moth emerged, and by the middle of May all had emerged and laid their eggs. One morning, shortly before school opened, we discovered one just as it had pushed its head and one leg through its cocoon. In about three hours it had worked its entire body out.

At first the moth is a most unattractive object. Its soft furry body and wings are all wet and crumpled, but in a short time the wings begin to spread and dry; the beautiful feathered antennæ spread out and there is a beautiful moth sometimes measuring over six inches from tip of wing to tip of wing.

The general color of its wings is a dark grayish brown, bordered by a lighter color, a dull tan. Across each wing, near the middle, extends a band of almost white. This band shades into a reddish brown; and near the apex of the front wings is a dark spot divided

At left, Cocoon; Center, Cecropia Moth; at Right, Pupa Case

by a fine, semicircular, white line. Between this spot and the margin of the wing is a patch of lavender.

The moth lives only a few days; lays its eggs; and then dies. Some of our moths had mated, so the eggs which they laid hatched. Just seventeen days after they were laid the little caterpillars crept out. There were probably two or three hundred. They were between an eight and a quarter of an inch in length, and black; each segment bearing six little tubercles.

The caterpillar sheds its skin four times before attaining its growth; after each molt growing noticeably larger. We found that in molting, the head part seemed to be shed separately. It was quite fascinating to watch them as they squirmed out of their

old skin; row after row of the tubercles appearing as they gradually worked the skin off towards the caudal end of the body. Mrs. Comstock says that the first molt takes place about four days after they hatch; but our caterpillars did not molt for nearly a week and a half. Perhaps confinement had something to do with their being so slow. At first great numbers died. They seemed to shrivel and dry up. Then we began dipping the leaves upon which they fed into water, and from then on they seemed to thrive. After the first molt they were a dull yellow or orange with black tubercles. After the second molt, which occurred in about two weeks, they were a clearer, brighter yellow and the tubercles were larger; those down the middle of the body on the second and third segments were red; the others yellow. Those on each side of the caterpillar and on the first segment were black or a steel blue. The third molt occurred about a week and half later, when the caterpillars appeared with a greenish blue body; the large tubercles were still red, and those down the center, yellow, as in the last molt; but those on the first segment and on the sides were now a beautiful turquoise blue. In another week they molted for the fourth time. Now the large tubercles were orange color and during this and the preceding stage the caterpillars ate voraciously and grew very rapidly. Some of them measured over three inches in length and were as large through as a man's thumb. They ate for two weeks and then began to spin.

It was very interesting to watch them. They began by stretching a few supporting strands of silk; then they fastened a very loose net work to these supports; and next began the spinning of the outer layer of the cocoon. In a very short time they were so covered that the rest of the work went on unseen and we were unable to determine the length of time required to complete the cocoon.

In the spring we had cut open some of the punctured cocoons and found them to be really wonderful pieces of work. They are composed of three walls or layers of silk, the first very tough and thick; the second made up of loosely woven threads; and the inner one thin and smooth as the inside of a milk weed pod. The cocoon makes a winter home which protects the pupa perfectly from both wet and cold. The cecropia always spins along the side of a branch; and at one end the threads are spun lengthwise, forming an opening through which the moth works its way out.

We succeeded in raising seventeen caterpillars from the eggs laid, and had five brought in just as ours had begun to spin. In about ten days the last of the twenty-two was spinning. For several days after the cocoons were apparently finished we often heard a queer noise, as though the caterpillars were turning over and over inside of the cocoons, so we decided that they must still be at work on the inner layers. When the cocoon is finished, the caterpillar again, and for the last time, sheds his skin and forms the pupa case. Here it remains during the winter and until the trees are in leaf the next spring; then the pupa skin is shed and the moth creeps out of its queer winter home.

The Summer Outing

ELLIOT R. DOWNING

With the coming of the enticing spring days, all mankind feels the "wanderlust" more or less. The small boy is prone to play hookey, the irresponsible man becomes a hobo, and even the sedate and hard-working pedagogue looks forward to the coming outing.

Many people deny themselves the pleasure of a vacation because of its expense. They feel that they can not leave home on an extensive journey, for railroad fares and hotel bills soon count up into prohibitive sums. Even the nearby summer resort is beyond the sum that has been saved to be spent in recreation. I therefore write to urge the feasibility of the vacation that is spent close to Nature—a return to the simple life of our nomadic forbears. This may not seem attractive to many adults, but there is no reason why boy or girl, and man and woman who are still such at heart, should not enjoy a real outing with very little expense. A tramping trip, a boat trip down the near-by-river, or just a drive across country behind the family horse, can be made to yield untold joys, if done in a simple way.

It is imperative that the luggage of the journey be reduced to very simple terms. If you are going to tote your bed and board on your back, every ounce counts. Even if the boat or carriage is going to carry it, it must be handled frequently, carried around obstructions in the stream, or stowed away under the seats of the wagon, where it will be out of the way, for the sake of comfort.

No recreation is quite as delectable as a tramp with a good companion, when you are entirely severed from the need of contact with civilization. To shoulder your pack in the morning, tramp as far as and in whatever direction fancy dictates, pitch your camp at night where you please, go on the next day, or stay if you wish—this is the acme of solid enjoyment. But it is such only when your load is easily endurable. The following suggestions are made as

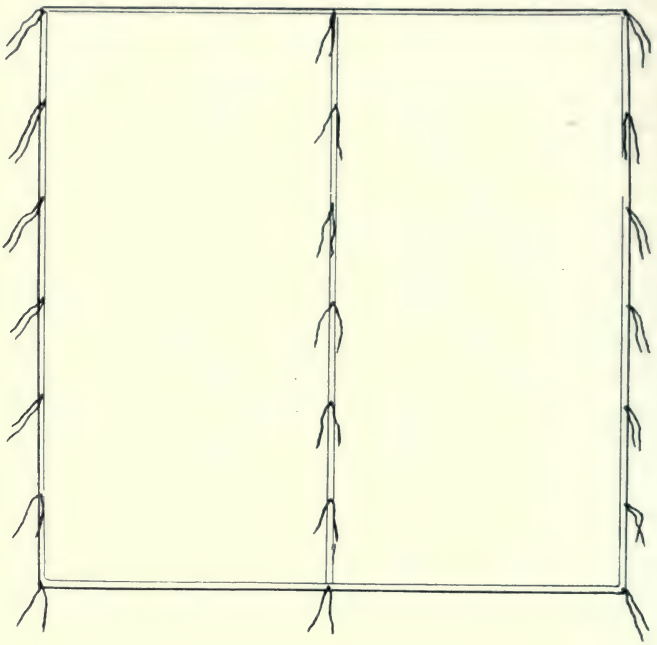

Fig. 1. Diagram of Tent

the result of many, many miles of just such tramping. They are given in the hope that some of the readers of the REVIEW, or the boys and girls who are their friends, may profit by them.

You will need a tent. Do not let this convey to your mind a canvas affair, with wooden poles and stakes, all of which must be carried, because that means an unbearable burden. Buy three yards of 3-yard wide extra heavy cotton sheeting. Bind it all the way round with inch tape, and sew a length of the tape down the middle of the sheeting. This tape is to be sewed flat onto the sheeting, both edges being sewed. At intervals of half a yard, sew

some 30-inch pieces of ¾ inch tape by the middle point to the strips of tape in the middle of the sheeting, and to the opposite edges that are parallel to this strip. The diagram shows the sheeting bound, with attached tapes. These tapes need to be sewed on very securely. This is the tent, and it may be pitched in several ways.

To make the tent water-proof, buy a pint of raw linseed oil. Put this in a dish like a wash basin. Hang the tent up by one edge in the attic or cellar; spread some newspapers on the floor under it. Dip the palms of your clean hands into the basin of oil, and rub oil into the cloth, making the oil go just as far as you

FIG. 2.

possibly can. The object is to fill the pores of the cloth but to leave no superfluous oil on the cloth. Proceed in this way until the whole cloth is oiled. Leave it hanging indoors for ten days. Then hang it outdoors for three days in a good sunshiny place.

The tent, when completed, need not weigh more than two and one-half pounds. It serves as a cover for your pack in tramping. With any sort of care, it will last for years. I now have such a tent made ten years ago, which has been my companion over hundreds of miles of road, and has sheltered me in all sorts of weather.

The easiest way to pitch the tent is to cut one pole about ten feet long and two shorter ones five feet long. The two latter should have a crotch at one end. Sharpen the butts of all three sticks.

For a camp site, select a gentle slope, or else back the tent up against a log. Drive the two shorter posts into the ground a little over six feet apart, inclining them towards each other so that the crotch ends will be together. Set the thin end of the long pole in the crotches and let the other end go back onto the hillside or log. Now tie the fasteners on the center tape along this ridge pole; spread the sides of the tent, and drive two or three ground stakes to which to tie the side tapes, at the front of the tent. Roll a stick of timber on each side of the tent so as to hold the sides down at the back. This makes a very comfortable shelter for two.

Carry a triangular piece of oiled sheeting 4½ feet on each of two

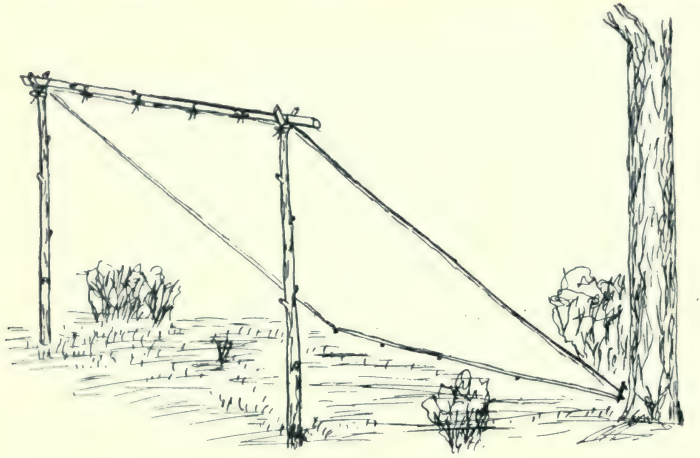

Fig. 3. Tent pitched as a Lean-to

sides and 6¼ feet on the third side. The angle included between the two shorter sides should be nearly a right angle. Bind this with tape, and attach two or three tie tapes to each side. This will fill in the front door of the tent, and pretty effectively keep out the rain.

By putting a pair of 5-foot poles both at the front and at the back of the tent, a regular A-shaped tent is made. The triangular piece fills one end. The cloth may also be used as a lean-to tent. To use it this way, drive two 6-foot crotched stakes ten feet apart. Lay a strong pole in the crotches, connecting these. Tie the tapes on one edge of the tent to this pole. Stretch the cloth back to the ground, and tie the tapes on the opposite edge to stakes. A fire

built in front of the lean-to will make the tent comfortable even on a cold night, if the wind is not blowing.

A second requisite for comfort at night is a bed with bedding. One can always find the material for making a comfortable bed on the ground. In the evergreen woods, boughs of balsam laid down with the butts all pointing in one direction, the concave face of the bough turned down, will make the foundation for the bed. On top of this may be spread finer twigs. If you are going to camp for several days in the same spot, it pays to gather dry leaves, ferns, or to dry out sphagnum moss for bedding by spreading it on the rocks during the sunny hours of the day. Along the shores of the lake or ocean, one may select a sandy spot far enough above water level so that the sand is dry, and pitch the tent so that you may lie in a wallow of the sand that you fit comfortably to your body by appropriate wiggling.

If you object to lying upon the ground a bed may be easily built by driving short crotched sticks into the ground and on these supporting poles 6½ feet long for the long sides of the bed, and 2½ feet long for the short sides. Tie to this framework some cross slats made of saplings and then put the balsam boughs upon it. It will probably be necessary to judiciously introduce added supports along the sides of the bed, after you have given it a trial.

At two or three points in making up the equipment for an outing, it is poor economy to economize. One of these is the selection of the blankets. You want the minimum of weight with the maximum of warmth. A soft blanket made of fine wool and of ample size is desirable. It should be a couple of feet longer than you are, and the width should be three times the circumference of your body. Such a blanket can hardly be purchased for less than six dollars.

With good grade wool comfort filler and some light weight gray flannel or dark outing flannel, an ingenious youngster can make a comfort that will be warm and relatively cheap. Do not tie the wool in at too many places, but only enough to hold it in place, for after a few camping trips, you will probably find it necessary to take the cover off to wash it. Take with you three or four horse blanket safety pins. With these you can pin your blanket around you, so that even if you do roll about a bit in the night, you will not be uncovered. It is just such little tricks as this that make the difference between camping with comfort and in misery.

If you are out in fly time, a very essential article for the night's comfort is the mosquito net. Take a couple of yards of mosquito netting, or better, if you are in the north woods where black flies are troublesome, take a square of cheese cloth a yard and a half on each side. You can make a little tent out of this, with crotched uprights and a short ridge pole, large enough to cover your head and to keep that part of your anatomy free from mosquito trouble. The rest of you is covered up in the blanket. Fasten down the edges of the little head tent with sticks held in place by stakes driven into the ground. This is not as comfortable a device as a tent of mosquito netting that will fit the inside of the big tent, but it is much lighter, and does very well for the tramp trip. If you are going to camp much, a head net made of fine bobinet is an improvement over the mosquito bar, for it will stand a great deal of wear and tear.

The next important item is your personal clothing. In books devoted to camping, one finds all sorts recommended. If one were to wait until he was able to purchase the suggested outfit, he never would camp out unless he were hereditarily blest with a long purse. Briefly, the one requirement for clothes for the camp trip is—old clothes, and as few of them as possible. Dress as you would for work around home. If you are going to the north woods, take along a suit of light-weight woolen underwear. I take also a suit of rather heavy woolen underwear to put on for the night, a couple of extra pairs of socks, and a pair of old slippers, also for night wear. A sweater is advisable, and is preferable to a coat. A vest is handy because of its numerous pockets. Be sure to take along needle and thread and buttons.

You are wearing, then, an old felt hat or cap, a light-weight flannel shirt, vest, trousers, the same underwear you would wear at home, or if in the north woods light weight woolen underwear, and an old pair of shoes that use has demonstrated to be comfortable. These latter should be in good repair. After drying them at night by the camp fire, oil them with bacon grease.

You are carrying two pairs of socks, a sweater, extra underwear and slippers for night. The equipment for the woman should be similar including a flannel waist, and a short skirt of tough goods. A denham skirt with bloomers of the same material make a good combination, the skirt to be shed when sufficiently far from civilization. Ordinary khaki leggings are necessary for the woman in country that is at all rough.

Put the extra clothing in an old flour sack. This bag, full of leaves makes a good pillow at night. In this sack can be carried your toilet necessities, a comb, tooth brush, a small can of boric acid, and a few safety pins of ordinary size. Accidents will happen to clothing, and one does not want to interrupt the day's march by stopping to sew up rents. The boric acid dissolved in water makes an antiseptic wash that will meet almost any emergency. A small roll of surgeon's adhesive tape may well be added to the equipment. A bar of soap for washing dishes may also be permitted in the duffle bag. On rare occasions, this may be applied personally.

The kit of camp tools and cooking utensils must be reduced to a minimum. A belt axe with good steel in the blade can be bought for 75 cts. Try it out at home to make sure that it will retain its edge. Carry a fine-grained flat file to sharpen it with. Carry a serviceable knife. The pocket knife is best. It should have one good strong blade, and should be made of steel that will keep an edge even when you are cutting a tin can. A fork and spoon apiece, frying pan, and a couple of kettles are enough equipment for two persons. There is a very convenient cooking kit that can be purchased of dealers in army supplies. It is a frying pan with a plate that fits into it. The handle of the frying pan is hinged, and bends over so as to hold the utensils together. There is also room between the two for storing some of your supplies. A couple of small aluminum kettles that fit one inside of the other, holding about a quart and three pints respectively, are ideal, but a lard pail and a coffee can fitting inside of it have served the author for many years. If the bales of the pails do not fasten on with rivets, punch holes through opposite sides of each pail and stick the curved ends of the bales through the holes. Otherwise you will spill your cooking at the first camp fire when the solder melts. A small tin cup can be carried on the belt. This seems a meager equipment for several days in camp. But be persuaded that it is sufficient, for if you start out with more, you will only throw the appliances away in the first twenty-four hours of tramping.

Finally, there must be considered the food. Here the novice makes his greatest mistake. He is prone to load up with an abundance of good things to tickle his palate on the journey, but the food must be rigidly selected with a view to giving a maximum of nutrition with a minimum of weight, if it is to be toted on your

back. The necessary foods, with the quantities of each, are as follows for two persons, for a week: Rice, ½ lb.; sugar, 3 lbs.; flour, 5 lbs.; oatmeal, 1 lb.; beans, 1 lb.; raisins, 2 lbs.; prunes, 2 lbs.; dried black figs, 1 lb.; erbswurst, 2 lbs.; bacon, 2 bls.; tea 4 oz.; dried cranberries, 1 small can; dried onions, 1 small can.

The flour is preferably whole wheat flour and white flour mixed in the proportion of 4 lbs. of the former to 1 lb. of the latter. You

FIG. 4. School boy off for a "tramp."

may add to this list of supplies four cakes of sweet chocolate, and 1 lb. meat nuts. These, with the raisins, serve for noon lunches and can be carried in the pocket so as to avoid unfastening the packs. It is ordinarily wise to be rather careful not to over eat on the outing. You are so likely to work up a generous appetite, to satisfy it when tired, and so bring on indigestion. The above list of foods is given as adequate, but it will not suffice for gourmandizing. Ordinarily the country itself will yield some fish, frogs' legs, or other game. The above list of food, some 23 lbs. in all, yields about 35,000 calories. If you can not depend on the

addition of 3 or 4 lbs. of fish or game or similar supplies, take a couple of pounds of dried beef.

It pays to put up your provisions in small cloth bags. Save salt sacks or flour sacks in anticipation of the trip. Sew by the middle point a foot or foot and a half of tape near the mouth of such a sack so that it may be conveniently tied up. When the tie string is sewed on, it will not be lost. Put only one sort of food into each sack, and label it plainly with an express package marking pencil. It is such a comfort to come to camp at night, open your pack with the assurance that the food will not be mixed in one glorious jumble, with much of the mixture in the interstices of your blankets or clothing.

Most of the foods listed above can be bought at any grocery store, but erbswurst, desiccated vegetables, and milk powder may have to be bought of dealers in campers' supplies, such as Abercrombie and Fitch, of New York City, or Von Lengerke and Antoine of Chicago. The large mail order houses also carry such supplies.

There have been enumerated a good many articles that must be carried. When going alone, these articles must be made up into a bundle which can be fastened into a harness that fits the shoulders and head so as to be carried with comfort. When two persons are going, two packs may be made, or one person may carry the grub, camera plates, and such heavy articles in a water-proof sack. For ease of carriage, nothing quite equals the Swiss ruck sack. Such a sack may be purchased of any campers' supply house, or may be made as follows:

Take a piece of water-proof cloth a foot and a half wide and a yard long. In purchasing the cloth, buy three-quarters of a yard a yard wide. Light weight water-proof duck can be bought at any dry goods store, or can be ordered from the supply houses already mentioned. Fold this piece so as to make a double piece eighteen inches square. Sew the opposite edges firmly and turn inside out. This makes a sack open at one end. Fig. 5. Turn in a seam a half inch wide around this opening, and sew it down. On the middle of one side of the mouth sew a flap six inches wide and eight inches long. The edges of this flap should be bound with tape or turned in so as to form a seam. Cut out a series of holes three inches apart in the seam around the mouth of the sack, and button-hole stitch them. Run a long shoe lace through these holes so that the

mouth of the sack can be drawn tight with this puckering string. When it is so drawn tight, the flap that has been sewed on will fold over and cover the hole. Put on a couple of buttons so that the flap may be buttoned tight over the hole and so keep out rain.

Reinforce the lower corner of the sack by sewing on an additional thickness of the cloth, and then sew on a double strip of cloth three inches long, to one end of which is fastened an ordinary harness

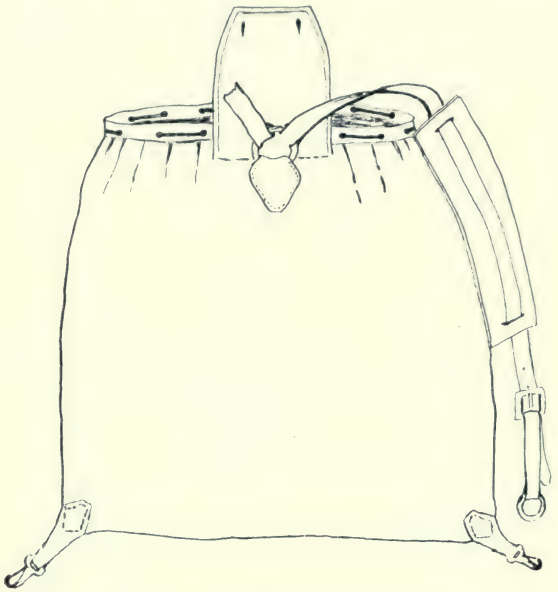

FIG. 5. Rucksack from rear.

snap. In the middle of the mouth under the center of the flap, sew on a four inch square of the cloth doubled to reinforce this point, and then rivet on, or have the harness maker sew on a piece of leather holding an ordinary harness ring. Sew to this ring two straps twenty-four inches long. Next sew a small ring onto a short strap. On the other end of the strap, let there be a buckle. Make two of these short six inch straps. Punch holes in the ends of the long straps attached to the ruck sack so that they may fasten into the buckle of the short straps. The short straps are now attached to the long straps, the rings of the short straps are snapped onto the lower corner of the ruck sack. The straps pass over the shoulders when the ruck sack is worn, and the long straps are hitched up in the buckles to a comfortable length.

If a couple of pockets made of the same water-proof material are sewed to the outside of the pack—not the side to be worn against the back, and the mouths of these pockets are covered with flaps that button down, they will be found very convenient to carry small utensils. The ruck sack when packed will easily carry twenty-five to thirty pounds of provisions. The straps are very prone to cut into the shoulder unless they are provided with shouder pads. Cut a strip of thin sole leather a foot long and three inches wide. Near the center of either end, cut a cross slit so that the strap of the

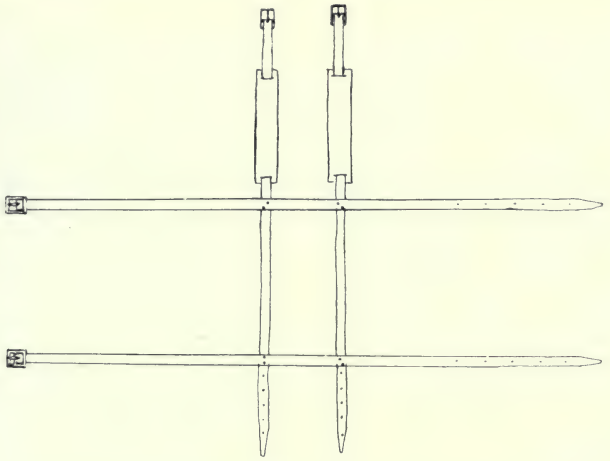

FIG. 6. Pack strap spread out. The face shown here should be turned down to the floor when loading.

ruck sack may pass through these slits. Such a shoulder pad on each strap will prevent the burden from becoming uncomfortable.

The pack straps are made as follows. (Fig. 6.) Lay down on the floor two five-foot straps about the weight of ordinary trunk straps. Put on each of these straps shoulder pads similar to those already described for the ruck sack. These are to be laid parallel to each other, and twelve inches apart. The buckles on these straps are to be at corresponding ends of the straps. Two feet from the buckle ends, lay another strap seven feet long and two feet below it lay a second cross strap, the buckles at corresponding ends, the straps parallel, and at right angles to the first straps. Rivet these straps firmly together at the four points where they cross. When the pack is made up, it is held in this harness.

To make the pack, spread the tent on the floor, fold it once with the tapes inside. Fold the blankets so as to make a pad about two by three feet, and lay it on the tent. On this lay clothing, utensils and, if necessary, food supplies. Fold the tent over so as to cover this and make a water tight bundle. Pick this up and lay it down on the outspread pack straps, the long way of the bundle parallel with the five-foot straps. The seven-foot straps will now encircle the bundle and may be strapped securely about it. The other straps with the shoulder pads go over the shoulders and are

FIG. 7. Packing.

adjusted properly by means of the buckles . The bulk of the pack should be above the encircling straps rather than below. That is, make the pack high; it carries more easily. The blanket is against your back and makes a soft cushion.

The pack carries more readily also if a tumpline is attached to it. Fasten onto the upper part of the pack a robe or strap that bears a broad piece of leather like the shoulder pad so that it may be worn over the head. This strap may be permanently attached to the pair of riveted points on the upper part of the harness. It should have one buckle on it so that it may be adjusted to proper length. The tumpline is not intended to bear much weight, but rather to balance the pack. The illustration above will make clear the methods of making the pack straps and wearing them.

Camp cooking is an art that can be acquired only by experience. It is well, in anticipation of the camping trip, to build a fire in your back yard and try cooking a few meals before you start on your pilgrimage. Otherwise you may find that you spoil so much of your food in the first few attempts that the rations taken are so much lessened as to produce serious want or cut short the trip. The first essential in camp cookery is the proper sort of fire. If you merely want to prepare soup or broil bacon and fish, the fire should be only a small one. Select eight or ten sticks of maple,

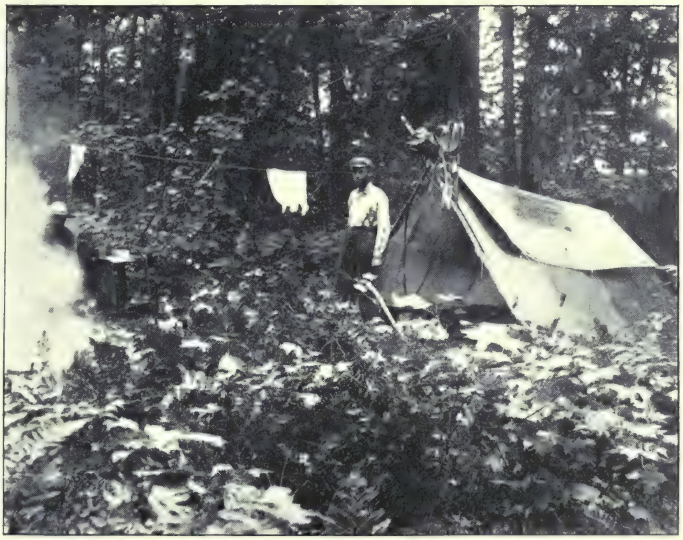

FIG. 8. Camp and camp fire.

birch, or other hard wood, a foot long, an inch or so in diameter, which you have cut from dry stuff. If it has been raining, so that the ground is soaked, dead standing trees are the best to use for the wood supply. Select four or five slender sticks of softer wood, or split a couple of the hard wood sticks into smaller thickness for kindling. With a knife, cut a good bunch of shavings on one side of each of these pine sticks or kindlings. Set the sticks up on end, the tips of the shavings pointing down, the shavings turned toward each other. Let the top of the several sticks come together and hold each other up in a sort of tripod arrangement. Stand the

hard wood sticks up against these. A very small amount of wood so arranged will boil the kettle, and when the wood has burned down somewhat, will fry the bacon.

On each side of the pile of wood, drive a crotched stick. Lay a pole across these two sticks, to support the kettle. A length or two of telephone wire 18 inches long carried in the pack can be bent so as to make a very convenient hook. Or, you can have the crotch sticks short enough so that the pole may be put through the bale of the kettle. Have this prepared before the fire is lighted, and fill the larger kettle with water. A heaping tablespoonful of erbswurst stirred into a cup of boiling water makes a very agreeable soup. The rest of the water may be used to make the tea. Woodsmen seem to prefer tea to coffee on a tramp. Neither is necessary. Tea should be made weak and used rather to quench thirst than as a stimulant. By the time the water is boiling, the fire will have burned down enough to fry the bacon. Do not try to fry bacon when the flames are curling up around the pan. Wait until your fire is reduced to coals.

Baking bread in camp is the most difficult process that is required of the ordinary camper. It is quite necessary to learn to do it, unless you are willing to lug a good deal of extra weight in bread that is already made. You probably are carrying a tin cup with a capacity of about one-half pint. Mix one cupful of flour, a level teaspoonful of salt, two teaspoonfuls of sugar, a heaping teaspoonful of baking powder, a level tablespoonful of powdered milk. The last ingredient may be omitted. Mix this with water in the pail and beat it up vigorously so that it has the consistency of very thick cream. Add more flour, and stir until it makes a stiff dough that will not run when the pan is inclined.

The fire for baking bread should be built against a back log. Take a log three feet or so long, and at least eight or ten inches in diameter. Set it in front of the tent six feet or so away; support it on two shorter three-inch logs that lie at right angles to it. Now build the fire of smaller stuff, preferably hard wood, the sticks laid parallel to and against the face of the back log.

If good-sized logs are not available, drive in a couple of pairs of sticks, the two sticks of each pair being four or five inches from each other, and the two pairs distant from each other about three feet. Set three or four small logs three and one-half feet long in these so that they will pile up one on the other. The fire built against such

a back will reflect much warmth into the tent. It is the night camp fire as well as the cook's fire.

After the back logs are burning well, rake out some of the coals to form a heap in front of the fire; cover these with ashes. Set the greased frying pan, with one-half of the dough in it slantingly on the ash covered coals so the opening of the pan faces the glowing back log. The pan may need to be propped up some. The heat from the coals bakes the under sides of the bread, while the reflected heat from the back log bakes the top of it. It may be baked in hot ashes, the cover of the pan on and covered with ashes. A few trials at this are advisable before you get to camp, for you must have a fire hot enough to make the bread rise but not hot enough to burn it, and this can be learned only by experience. When you have acquired the art, you make a pan of bread that has a delectable taste, at least in camp. You may use corn meal in place of the whole wheat flour, using one cup of corn meal, one of flour, and bake corn bread in this same way.

Boiled rice with raisins makes a good camp dish. Fill the large kettle with water; bring it to a vigorous boil. Add a half teaspoonful of salt. Pour in a half cupful of rice and let it continue to boil hard for twenty minutes. A couple of minutes before the end of this time, throw in a handful of raisins. Take the kettle off the fire, pour off the water. This will be eaten in camp with sugar and milk; the latter made by dissolving milk powder in hot water, and will be enjoyed thoroughly.

Dried prunes or dried apples should be put to soak at night. They can then be stewed for twenty minutes while breakfast food is cooking in the morning, and will add a tasty bit to the breakfast. In the same way the desiccated cranberries and onions will need to be soaked over night.

It is always well to hang up kettles of prepared food on the bushes or low trees at night, and the pack containing your food material should be taken into the tent or else hung up where it will be out of the reach of night prowling animals. I have watched a skunk in the dim light of the early day help himself to the camp's provisions when we had carelessly neglected to hang them up the night before. We preferred the prospect of going hungry to going perfumed.

Much of the delight of the camp at night is due to the camp fire. A camp site should be selected where a good wood supply is avail-

able, near good water, and where some sort of bedding is handy. It is a good rule, when you encounter this combination after three o'clock, to stop and pitch camp. The fire should be built where it cannot possibly spread to adjacent timber, or get to running in the leaves or the dry grass. It should not be built out of or against logs or stumps that are so large that you can not put the fire out when you leave the next morning. Good judgment in selecting camp sites is one of the marks of the woodsman. Two or three sticks of hard wood, not too dry, laid on the fire just before turning in, will hold the fire for many hours. Lay them parallel to each other and close together. If the night is cool, you will probably have to turn out two or three times to renew the fire, and it is well to have a dozen good-sized sticks of wood three feet long and eight or ten inches in diameter to carry through the night.

Finally it adds a good deal to the zest of the trip if it can have some objective. To follow down a meandering stream and explore the possibilities of fishing in it; to set out for a particular mountain, or even conspicuous hill; to tramp to an abandoned quarry or mine looking for fossils or minerals; to make the rounds of some lake intent on securing pictures of the nests of water birds or of the birds themselves—some definite objective of this sort is very much worth while on the camping trip. I should not forget a good book as a part of the equipment. If you have not read or have not recently reread Stevenson's "Travels with a Donkey," it makes a good companion for the camp fire.

Book Reviews

PLANT LIFE. Charles A. Hall. Pp. xi + 380; 74 full page illustrations, 50 of which are in colors. A. & C. Black, London, 1915.

This work is apparently the result of an attempt to give a semi-popular presentation of the science of botany. The order of topics, namely, the great groups of plants from lowest to highest, is not unlike that found in several well-known books. To these topics others are added dealing with the food of plants, perpetuation of the race, plant defenses, and a discussion of plant ecology as a new field of botany.

Like a good many other writers the author assumes that since one-celled forms are simplest and since protoplasm is fundamental

to all living things, the beginner in studying plants naturally should first take up a discussion of one-celled organism and of protoplasm. Scientists who have long since passed the time when *they began* to study plants sometimes overlook the fact that large and relatively complex plants seem more simple as beginning topics than do the really simple one-celled plants and animals. The one factor of size which makes great magnification necessary for observation, thus involving new and strange apparatus, renders the study of small forms complex and difficult, while the commonplace plants of field, farm, and garden seem easy and logical subjects for beginning botanical study. The author's ninth chapter on "The Food of Plants" would have been more purposeful, and would have helped much to give significance to descriptions of plant structures if this chapter had come first or at least early in the book.

The supposed evolutionary order of development of the plant kingdom is followed, and type plants which illustrate increasing complexity are discussed. Unusually good colored plates are designed to illustrate the natural appearance of many of the type plants. In the text discussion technical names are usually given meaning by reference to the Greek or Latin derivation of the terms used. The amount and quality of botanical information in the book, and the style of presentation is such that a serious-minded general reader will find the book valuable and entertaining.

Otis W. Caldwell.

Practical Field Botany. A. R. Horwood. Pp. ix + 193. J. B. Lippincott Company, Philadelphia, 1915.

This book was written by an English author primarily for use in his native land. It is an interesting combination of the old and the new in botanical study. It argues for field work, systematic botany, and for the ecological point of view. One who reads the book is impressed with the return of old botanical friends, but upon close inspection the reader finds that in this case these old friends usually appear in new relations. For example, when one notes the chapter of forty-two pages on how to collect, recount, label and store herbarium specimens, he fears that he is being urged to return to "dead botany;" but when he reads the chapters which make use of technical herbarium directions and finds therein such topics as "Plant Survey Work," "Flora of a

New Soil," "Weeds in a Town," "Plants and the Effects of Grazing," etc., it becomes clear that the intention is to develop dynamic and not static collections of plants. We may select "Meadows and Pasture Plants" as a topic to illustrate the point of view. There is first a brief discussion of different kinds of meadows—dry, wet, lowland, and upland meadows. Then follows a list of the leading plants which are likely to be found in most meadows, then brief lists of the plants which characterize each particular kind of meadow.

Fifty-five pages of the book consist of lists and brief discussions of common plant formations. Other parts of the book discuss the purpose, scope, and methods of botanical instruction, the whole constituting a valuable reference work for one who is trying to teach pupils to study plants.

OTIS W. CALDWELL.

INSECTS INJURIOUS TO THE HOUSEHOLD. Glenn W. Herrick. P. XV + 470. Price, $1.75. The Macmillan Co.

This is the latest edition to the series of the excellent volumes of The Rural Science Series. The insects considered are the house fly and other flies that frequent houses, mosquitoes, the bedbug, cockroach and flea, ants, insects that injure clothes, cereals, preserved fruits, meats and cheese, some human parasites and pests, woodboring and poisonous insects.

The book in an excellent addition to the nature library of school or teacher for it contains a wealth of humanly interesting facts about those insects that affect us most. The reader will find on opening to almost any page, unless he is already a well informed tomolenogist, that as he reads, many questions that have been vaguely in his mind for many years will receive their answers, for the author is particularly happy in supplying the information the average person wants about the common insects and that most scientific writers omit as too commonplace. The chapters are very practical too, supplying the information needed to rid the premises of undesirable insect pests.

NATURE-STUDY REVIEW

Devoted Primarily to all Scientific Studies
of Nature in Elementary Schools

VOL. 12, No. 6 SEPTEMBER, 1916 Whole No. 101

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THE
NATURE-STUDY REVIEW

VOL. 12 SEPTEMBER, 1916 No. 6

When the Birds Nested

L. H. BAILEY

I was fortunate to have been born and sent forth near a brook and several catholes,* in the forests and with a varied wild life. The wolves had just disappeared as I came into knowledge of my surroundings, but bears and lynxes were now and then seen and deer were not uncommon. Nearby was a wonderful rookery of passenger pigeons, and all my early boyhood was animated by the clouds of flying birds in the feeding seasons. The Indians, migrating with the fishing and the game, were a constant wonder. A mile away was Lake Michigan, and although the roar of it became a part of me and I often ran its shores, it was nevertheless always another world, a great place outside of me, mighty and compelling but yet not within my waking ambitions.

I doubt whether any recent boy feels that old charm of the cathole—of that small swamp with a deep hole in the center, in which everything seemed to grow, where strange birds nested, to which all things retreated, where there was water life beyond reach, and whence a small boy expected everything unearthly to come. It was a part of the pioneer life, how much a part we did not then know for we thought the fever-and-ague to come from the miasma of the newly broken ground. It must have been more of a factor with us than the coulee of the farther Out-West, for it was wet and full of breeds year in and year out. I cannot make the young folk understand that certain dry lands were once the scene of catholes,

*NOTE—The term cathole seems to be little known at present, as it was used in the early days in Michigan. It is not a hole in the cellar door to let the cat in and out; nor is it a nautical term, as in the dictionaries. It was applied to a small bog or swamp, usually less than an acre in extent, as I recall it, and sometimes only four or six rods across. Commonly it was deep in the center, often with considerable muck deposit. These holes were undoubtedly post-glacial, perhaps in large part the depressions left from the melting of remaining masses of ice. About their edges grew willows, sedges, and other lowland growths, but the hard land came close around them. I have heard it said that they were called catholes because of the cattails that grew in them; and others say it is because they became depositories for departed cats and all other offcasts, but this I doubt; yet there were lots of things in those catholes.
L. H. B.

with perhaps a corduroy road across them and with the logs a-swim in spring, with whelms of peepers when the pussy willows were out, frightsome snakes of all imaginary kinds, and cat-bird nests in the margins. To this day the squall of the cat-bird recalls a cathole! Very well! They have gone with the Indian, the passenger pigeon, the many curious traps concealed in the runways, the burning logs, and the unsolvable mystery of the great woods.

My father's farm was a zoological and botanical garden,—not that it was different from any other farm, but because so many things seemed to live and grow there that I thought I could never find the end of them. To make a list of them, to put down where I saw them and what they did,—this seemed the only way to find out how many they were. This was no easy task, seeing that I did not know the names of them, in the early days, and had little way of finding out except to use such names as the settlers or certain antiquated books applied. Often I wonder whether the joy of the field is so keen in these perfected days when everything is explained so carefully and we are so well instructed in what we ought to see.

Three sets of lists I remember to have kept; one was of the daily weather, one of the birds, and later one of the plants. Very simple were these lists, scarcely to be dignified by the name of note-books, but they served to prolong and to multiply the experiences. Any old account book or composition book, with a few unused leaves, was sufficient. These leaves were carefully ruled up and down into columns for the name of the bird (marvellous names I must have given them!), when it began to build its nest, when completed, the first egg laid, the subsequent eggs unto the last, the period of incubation, when the birds flew, and how many. This was indeed a very simple record, but the number of nests under observation would run into the tens and perhaps more and each one was visited every day as regularly as the other "chores" were carried. It became a sort of game or play with me, and it was part of the game to visit the nests when the birds were away and would not be frightened. Back and forth from cultivating corn or driving the team here and there or following other regular farm work, these nests were home-plates and bases (we did not have base-ball then but only long-ball and two-old-cat), and reason enough to go the long way or the short way. Some few of the old trees still stand, and now, with memory running back to those years, I go

to them when I visit the old place and look for the nests and the eggs that are not there. The hollow stumps and rails have vanished years and years ago and I cannot look for the pale eggs of the blue-bird. Nor do I find the nests of the cat-bird or the chewink, and even the wren has left the premises. The day by day "tab" on those few birds became a real part of my life, all the more interesting to me, I fancy, because I knew so little about them from books and had so few ways of finding out. My observations must have been very imperfect; but how real were those birds and how I loved to put down the dates!

An Attractive Flower Book for Botany and Nature-Study Classes

C. C. Leeson

Much adverse criticism has been made against the idea of requiring herbarium collections as a part of the work in plant study. This is perhaps justly so for some reasons and for others quite entirely wrong. The old full sheet herbarium was usually relegated to the attic, for want of space in the living room, where it lay untouched from year to year,—except by insects and mice which usually made short work of it. The students were required to secure root and all in order to be scientific in their work and so, year after year, the classes were turned loose into the near-by woods and fields to root up the fast disappearing specimens until many of our wild flowers in the inhabited sections either have already or are fast nearing extinction. For these and other reasons the herbarium has been abandoned and what might be a means of acquaintance with and heightened interest in flowers has been lost altogether.

With a full realization of the inefficiency of the old system and a growing belief that nothing is quite so good as the collecting habit to get acquainted with nature, the writer has adopted a scheme in his Botany classes which, through four years of experience has proved so successful as to be worthy of passing on.

This is found in the making of a souvenir booklet of flowers and their appropriate quotations. This, when neatly arranged and given a suitable cover design, is worthy of a place in any souvenir collection or fits easily in with other books on the library shelf. The quotations serve to stimulate an interest in the real meaning and beauty of the flowers and to show of what prominence they are in literature as well as in science. This aesthetic phase of plant study is one which, I believe, is well worthy of study and which, by this scheme, is given excellent emphasis. The scholars have, in my experience, shown an eager interest in the making of these booklets, and I venture to say that they will always treasure and show them with just pride.

For from five to ten cents apiece the teacher can secure the blank booklets from the local printing firm and sell them to the pupils or each may make his own. In pressing they should pare down thick stems or flowers to prevent a bungling set of specimens,

press hard to prevent wrinkling, and dry rapidly and thoroughly to prevent blackening. The specimens may be secured to the pages by narrow strips of gum paper or fastened on with library glue.

Quotations may be secured from a variety of sources and authors or possibly if the student is apt at writing poetry he may compose some of his own. Quotation books and poem collections are good sources, also a book entitled "Language of the Flowers," published by Worthington Co., New York City. Among the poets that have written often of the flowers are Longfellow, Lowell, Whittier, Bryant, Wordsworth, Tennyson, Elaine Goodale, and numerous others. A few desirable poems are: "Flowers," Longfellow; "Hymn to the Flowers," Horace Smith; "The Use of Flowers," Mary Howitt; "The Flowers of the Holy Land," Ralph H. Shaw; "Forest Hymn," Bryant.

A poem for the title page may be the following:

"This is the little book of bloom,
Whose pages written in perfume
Hold lyrics in a language known
To bees and butterflies alone."

The following brief list is merely suggestive:

"To comfort man,—to whisper hope
Whene'er his faith is dim,
For whoso careth for the flowers
Will much more care for him."
—*Mary Howitt.*

"A poem every flower is,
And every leaf a line,
And with delicious memories
They fill this heart of mine."
—*Lowell.*

"What a desolate place would be a world without flowers? It would be a face without a smile; a feast without a welcome. Are not flowers the stars of earth? Are not our stars the flowers of heaven?"—*Mrs. Balfour.*

"Consider the lilies of the field, how they grow, they toil not neither do they spin, and yet I say that Solomon in all his glory was not arrayed like one of these." *Luke 12:27.*

"Full many a flower is born to blush unseen,
And waste its sweetness on the desert air."—*Gray.*

"To me even the meanest flower that blows has thoughts that do often lie too deep for words."—*Wordsworth.*

"A faint, delicious springtime violet!
Thine odor, like a key,
Turns noiselessly in memory's ward to let
A thought of sorrow free."—*W. W. Story.*

"Sweet daisy, flower of love! when the birds are paired,
'Tis sweet to see thee, with thy blossom bared,
Smiling in virgin innocence serene,
Thy pearl crown above thy vest of green."—*John Leyden.*

"Oh, that it were with me
As with the flower;
Blooming on its own tree
For butterfly and bee
Its spring time morns:
That I might bloom mine hour
A rose in spite of thorns."

The following is a list by title only of some additional quotations relative to certain flowers: For-get-me-not, Percival; Bleeding hearts, Swineburn; Trailing Arbutus, Rose T. Cook; Lily of the Valley, George Croly; Fringed Gentian, Bryant; Goldenrod, Thaxter; Violet, Wordsworth and Bryant; Lilac, Burns; Asters, Whittier and Goodale; Harbinger of Spring, Bernard Barton; Sunflower, Thompson; Evening Primrose, Keats; Pansy, Mary E. Bradly; Honey Suckle, Sir Walter Scott; Crocus, Patterson; Hepatica, Anemone, Clover, Red Cardinal, Blood Root, Columbine, Meadow Rue, Wild Strawberry, Elaine Reed Goodale.

Animal Competitors, by Ernest Ingersoll. Pp. 319. $1.00 net. Sturgis & Walton, New York.

It is often easier to get information about strange foreign animals than about those in your house, yard or field. For this reason this little handbook, summarizing the general natural history and best economic procedure applicable to our common, four-footed vermin, and valuable wild quadrupeds, is a very welcome addition to the library of the teacher and of the school, and this is particularly so of rural communities. The book is based, to a large extent, upon the activities of the Biological Survey of the U. S. Dept. of Agriculture, results which are beyond the reach of the average teacher. This is the only recent, comprehensive account of the common household, garden and field pests, and furthermore it contains much about fur-bearing animals and game. Here is brought together a large amount of interesting and valuable information about rats, mice, rabbits, moles, skunks, muskrats, foxes and deer, which has been widely scattered and inaccessible to most persons.

Nature-Study in Rhode Island*

WILLIAM GOULD VINAL
The Rhode Island Normal School.

What is Nature-Study? In defining Nature-Study I can do no better than to quote Professor Hodge, that "Nature-Study is learning those things in nature that are best worth knowing to the end of doing those things that make life most worth the living."

There are three large phases in Nature-Study,—the plant-animal, the physics-chemistry, and the gardening phase. The plant-animal phase comes in the first six grades and I would call it *Community Nature-Study* in order to give the community idea proper emphasis. *School Gardening* should come in the fifth and sixth grades and *Home Gardening* in the seventh. I should call this study *Home Science* in the seventh grade and in the eighth grade let it broaden into *Civic Science.*

School gardening is one form of practical Nature-Study. The usual method in School Gardening has been the plain fact-method. Two inches deep; three inches apart in a row; and rows three feet apart is not especially interesting but the "Why" of each step in gardening is the Nature-Study method. There is no fun in "hilling up" potatoes. If the farmer boy had asked why should potatoes be "hilled up" he might have discovered that it was simply an inherited custom and that the hill drained the water away from the plant and exposed more surface for evaporation. The flat method is, therefore, better in dry soil. If farm life had been made more interesting there would not have been such a pronounced exodus from the farm.

Nature-Study is usually limited to the plants and animals and Elementary Science is usually limited to Physics and Chemistry. They are both scientific and they are both nature-study. The difference is in the emphasis. In Nature-study emphasis is placed on the appreciative side whereas in Elementary Science the subject is placed first.

Club work is a means of organization. At the Nature-study exhibit which was held last October a superintendent of schools stood looking at some young apple trees which had been grafted. The remark was ventured that it was "practical work." His

*A lecture given in the Extension Course of the Rhode Island Normal School, February 12, 1916.

answer was, "Yes, when done as club work." It seems as though there is danger of over emphasizing the necessity of a club. Grafting apple trees is more important than a Providence County Boys' Club for Grafting Apple Trees.

The Value of Nature-study.—I do not know a superintendent of schools in Rhode Island who does not think that Nature-study is of great value although they have not all adjusted their courses to the needs of such a training.

We are living in the midst of an educational upheaval. If we accept the public education as a system which prepares for daily living we must stop trying to produce "scholars (?)" and consider what the child needs. In the *Journal of Educational Psychology*, September, 1915, is an article on the "Fundamentals in Education." It says, "Is Arithmetic fundamental? Assuredly not! Even a casual inquiry will show that in all lines of activity the need for Arithmetic is vanishingly small. Is Handwriting fundamental? The business man or business woman scarcely use the pen. Is Spelling fundamental? Recent studies have shown that ninety per cent of all the words that are ordinarily used in writing are found in a list of 1,000 words. Of these not over 200 words would give trouble. Is Grammar fundamental? All experiments agree that its contribution to efficiency in the use of language is negligible."

Nature produces abundantly. It takes 1,000 seeds to produce a maple tree; a million eggs for one oyster. What a great waste in life. Most of the teaching of arithmetic, spelling, grammar, and penmanship in the school are like the machinery of nature. The amount of knowledge that the child gets is astonishingly small. The old graduation motto that "Knowledge is Power" may be a basic but it is not the chief function of education. There is a vast difference between the knowledge of swimming and the ability to swim. The laboratory, the sewing room, the school kitchen, and the manual arts shop create this chief function which is not knowledge but the power to do. Why over emphasize the acquiring of second-hand information when in life we meet our problems face to face?

There is an old saying that "He who knows not that he knows not is a fool, shun him." I have vanishing faith in this quotation. The psychology teacher recently showed a class a lawn scene,—three children in a hammock and a hedge in the background. The

question was asked, "How many boats are in the background?" There were no boats in the picture, but nearly every one put down a number. "What color is the little girl's necktie?" The little girl had no necktie, but every one knew (?) its color. Twenty-five nature objects such as the English sparrow, the oyster, the mullein plant, etc., were placed before the entering class last month for identification. There were scarcely any blanks in the list yet the results showed a meagre knowledge of the most common things of their environment. The prize answer was the case of calling the bluejay a cockatoo. I recently asked the members of a more advanced class whether their gizzard came before or after their stomach in the process of digestion. Only about 15 per cent said that they did not have a gizzard; many were sure it came after the stomach, and others were almost certain that it came before the stomach; only a few said they did not know. We cannot assume that the majority of these girls are fools. Many of them are better than the average in ability and intelligence. It is not a question of common honesty. It is a result of the present day school training. The teacher knows that she knows arithmetic and its allies. When it comes to Nature-study she has to say frequently that she does not know. When the teacher is willing to say that she does not know we can look for a different moulding of the mind in the pupil. Nature-study makes for intellectual honesty. Such is the method of scientific approach to all questions. When one knows that he knows not there is more chance for him to learn the truth of things as they are.

Professor Bagley, who has already been engaged to speak at the morning assembly of our next meeting of the Rhode Island Institute of Instruction, thinks that science is one of the fundamentals of our modern education. Why not? This is an age of science. The telephone, proper sewerage disposal, the automobile, etc., have a close relation to all of us but not so is the matter of learned discourse or writing poetry.

Since the value of the work is so generally recognized in Rhode Island I am not going to spend much time on that phase but pass directly to the organization.

Organization.—What shall we select out of this great mass of nature-study material?

Life is made up of real problems. We recently listened to a drill upon fractions. It was good mental gymnastics but dividing

three 79ths of a cent by four 36ths of a cent is not a real problem. It is artificial. If education is to be a preparation for life it must concern actual experiences in life. Teach the child real problems. These problems must be the ones that he will meet now and as he goes along. The colonists had the problem of protecting their cattle from the wolves. The many necks and peninsulas of the bay, nearly surrounded by water and only approached from one direction, formed a natural enclosure for the cattle. The name Cowpens' Point indicates its former use. The wolf traps of William Arnold and Thomas Olney, the elder, were referred to as boundary marks in the writing of deeds. There was no need of their studying gypsy moths as a problem and, on the other hand, we would not construct wolf traps in Manual Training, or spend much time studying the wolf as a pest. We are still building wolf traps in Arithmetic. We are still "hilling up" rules in grammar which cause evaporation of the real power of speech. Our plan has been to teach arithmetic as a subject and let the child find a use for it if he could. I overheard a state superintendent recently say that he was meeting the business men and together they are trying to decide what it is in arithmetic that they are really using. That seems like a proper approach. It then becomes necessary to help the child to solve these every-day problems.

What are some of the problems we are meeting today that are related to nature-study? I recently moved. The first house was heated with hot air and the new house with steam heat. The problem was to run a steam heater. There was no text book in our library to which I could go. I could have gone to my learned associates but they are specialists and if they know how to keep radiators warm it is in spite of their education. People who have a college degree but cannot boil potatoes or shingle a house are not educated, they have been put through a book process. They are fortunate if their learned career has not spoiled them for acquiring useful knowledge.

Pardon me if I again use a personal reference. One summer, while working my way through college, I had the fortunate experience to be an engineer of a peanut roaster. The owner was making repairs one morning and sent me for a saw to cut off a board. I brought him a splitting saw instead of a cross-cut saw. What that man said about a college education would not bear repeating before a Christian audience.

The Chemistry teacher has recently built a house near the Rochambeau Avenue Field. Every time he goes out to walk he brings ferns, small hemlocks, etc., home in his pocket. His neighbors laugh at him. By and by they will come around to see how he got such a beautiful lawn. His problem is to make shrubs and beautiful flowers grow where broom sedge and sorrel grew before.

The school secretary has bought a run-down farm in New Hampshire and spends her spare time on the many problems which are involved.

The Eighth Grade teacher has bought an automobile and wishes that the psychology teacher would give some common sense about automobiles.

This small twig is covered with scale insects. I broke it off a basswood tree which grows on the school grounds. If that insect becomes a serious menace to the beauty of the school grounds it furnishes a problem. I do not know its name. I do not know all about its life history. What an excellent chance for teacher and pupils to take hold of a real problem.

These teachers are getting a practical education. Running a furnace, beautifying a lawn, improving a run-down farm, driving an automobile, overcoming insect pests, are problems of Nature-study and Science that you and I are meeting. We are learning them in spite of our education. Many learn real teaching in the evening schools. Our education has been first technique and then using a small part of it; the education of the next generation should be first the need and then the technique. That was the method of Franklin, Galileo, Archimedes and so on back. They felt the need of certain things and went to work on those problems. Professor Thorndike has written an interesting article in the *Scientific Monthly*, for September, on "Science in the Middle Ages." The problem followed by the technique has been the method of scientific discovery.

The studying of these problems is called the project method. A round table was recently held at the Salem Normal School to discuss this method. They expected about a dozen people and about fifty came. This is a live question. There is an article in the January number of the *Teachers' College Record*, by Professor Woodhull on "Projects in Science," and another on the "Elements of Practical Arts for General Education," by Professor Bigelow. We can have individual projects and school or grade projects.

Many teachers in Rhode Island have carried out group projects with pronounced success as was shown in the exhibit last fall. The fly problem was worked out skilfully in our Seventh Grade; at Branch Avenue they had a clean-up campaign which not only meant back yards but teeth and hands; at Glendale a recent graduate organized a Camp Fire Group, and so on. We now need teachers who are willing to break away from the lock-step method and teach individual projects.

I would recommend then in organizing this study that first of all you should include the daily problems of science which are met by your pupils. Secondly, there are many things worth while with which the experience of the pupil may never bring him in contact, yet they are things that everyone should know, as—ventilation. Thirdly, every neighborhood has its individual needs. To know what these are you must make a survey of the exact condition and materials of nature-study in the community. A study of shellfish would be more appropriate for the sea town of Westerly than in Marieville. The problems of a mill village are not the same as those of a market garden community. The thrift of our lowland farmers as compared with the upland farmers is due to certain differences in their environment. Clean-up week is not so essential on the Blackstone Boulevard as the democracy of a school garden. Fourth. Hold conferences. Librarians, doctors, farmers, and others should take part in the discussion. At one meeting the discussion could be opened by those teachers who have worked out problems of science. Have a civic science day on which the health officers, the State Forester, the Water Commissioner, the Park Commissioner, the State Agriculturist, etc., tell you what they consider an essential civic intelligence in regard to their various fields. At another conference invite a plumber to tell you of what the everyday knowledge of plumbing should consist. In the same way invite the gas man, the orchardist, the florist, the market man, etc. Fifth. The problem should be related to the life of the community. This is called socializing.

Method.—Having decided what we are going to teach the next thing is to determine how to teach it. Time does not allow more than one illustration. Suppose that it is a seventh grade class in Home Science. The class is taught a few simple facts about air and water. Air is a substance and has weight, for instance. This knowledge is brought out by a few experiments. Many practical problems can be based upon this knowledge.

If I pour a little water into this U-shaped glass tube the liquid comes to the same height on each side. This illustrates the old axiom that water seeks its own level. It seems to be a contradiction, however, to another equally familiar adage that water will not run up hill. It is valuable to know that a U-shaped pipe from a spring will carry water as high in the house as the elevation of the spring. Other related uses of the knowledge are pumps, water supply system for the city or for a country home, sources of water in wells and springs, contamination of well water, plumbing, barometer, vacuum cleaners, syringe, fountain pen fillers, drainage, the siphon, etc.

The class is now ready for project work. The previous lessons have been suggested to some pupils as actual problems, the solution of which has become a personal necessity. It may be bad odors due to poor plumbing; dirt in the well water; conveying gasoline from a barrel to a motor boat, etc. Let them tend to these new needs which have been suggested. If some one has a pump at home and wishes to know how it works let him investigate. Pupils interested in drawing could take one of these problems: a map to show the city water system; diagram of the water pipes and connections in his own home; diagram of a force pump; sketch of a plan to bring water from a hillside spring to a home. Other lines of investigation might be irrigation; current events, such as found in the following magazines: *World's Work*, *Popular Mechanics*, *Scientific American*, *Harper's Magazine* and *St. Nicholas*, or if of a historic liking, the "Aqueducts of Rome." Each one of the class should choose at least one topic.

The class work would consist of reports, explanation of charts, and trips for investigation. Some reports will be handed to the teacher in writing and others will be given orally before the class. This brings in a need of good language. How the subject shall be presented depends upon the needs of the class. If the class is in the city, every pupil should know certain things about plumbing. For example, there is a U-shaped pipe beneath the sink. As it is this shape it always holds a little water and this forms a sort of seal which prevents the foul gases coming from the sewer into the house. Sometimes grease and filth collect in this trap and it should be cleaned by pouring in hot water and a disinfectant. This also gives a reason for rinsing the bowl after washing, which is not usually thought of, i. e., to remove the dirty water in the trap. Such

knowledge is useful but non-vocational. Whether one is to be a plumber, jeweler, or a housekeeper, he should be taught these elementary ideas as a part of his practical education.

Aids.—There are many aids in this state for teachers of Nature-study. Among these the Roger William's Park Museum is the most progressive and helpful. Museums were once thought to be storehouses for relics and antiques. Mr. Madison, the curator, prefers to call it the people's university, and he is living up to the title. In a bulletin of January, 1913, is the following statement: "Four years ago there were no Sunday lectures, no lectures for school children, no loan material for the schools." You have been given circulars which show the growth in this work. Remember, that in 1909 we did not enjoy any of these things at the Park Museum. Let us look at the figures for three year periods and note the trend of the times.

	1912	1915
Children attending lectures	6,373	27,148
Specimens loaned schools	318	1,353
Teachers using loan material	75	121
Book circulation	1,859	9,061

Last year one-third of the six grades went out to the park voluntarily for a nature talk and it was so popular that a general place has been arranged in the program of the city schools for such an event. Some of these children had never been in the city park before and in a few cases the teachers paid the fares. A school census recently showed a surprisingly large sum turned over to the moving picture houses by school children. Some of these five cent pieces would give better returns on investment if used in car fares to the museum. This is not an entirely new idea. The slogan of the City Planning Committee of the Sacramento Chamber of Commerce is, "The child has the same right to be taught to read a roadside as a book." We have just as much right to expect a city or town to pay the fares of children to the museum and to read the roadside as to ask them to purchase textbooks in arithmetic and other studies. The roadside and the museum are the textbooks of Nature-study.

The museum is a living museum in that it includes the roadside as a part of its equipment. Last year the curator and his assistants led the school children on 29 different trips with a total attendance of 301 children. Our children have a right to appreciate

and enjoy our parks and bays. In the NATURE-STUDY REVIEW for last October is an article on "Nature-Study in the War Zone." It tells us that in Holland "village museums include accumulations of years of field excursions of the school children. On alternate Fridays a score of wooden shoes clatter along the brick paved dike learning to know afield the 'wee beasties.' Up among the bonnie braes of Scotland they call it a school treat. Every Japanese pupil learns how to swim. In Switzerland the children learn to use their eyes and to know the beautiful. In Denmark, even the blind school children go into the magnificent beech forest." We are fortunate in having such an up-to-date museum. More teachers should take advantage of this opportunity to overcome the difficulties of field trips.

There are indications on all sides that we are waking up to the possibilities in field work. Over fifty troops of Boy Scouts have been organized in this state. There are sixteen troops in this city with forty boys to a troop. Then there are the Camp Fire Girls, the Rhode Island Field Naturalists' Society, which numbers nearly 150 members, many of whom are teachers. At Brown University they have recently passed a requirement that every graduate must know how to swim. The Horticultural Society, Public Park Association, League of Improvement Societies, Audubon Society, and many others point to an awakened interest in the great out-of-doors.

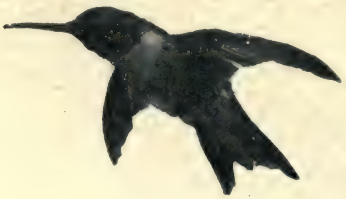
Another aid in this field work is the normal school. Our girls need practice as well as theory in leading field trips. They will be only too glad to help you in this work. This has already been done in the past and it is hoped that more opportunities will be offered in the future.

I have explained how teachers can overcome the obstacles to field trips. Another obstacle to teaching Nature-study is the obtaining of material in the city schools. This is oftentimes imaginary. At the Slater Avenue School, in Providence, children observed 100 species of flowers and 25 species of birds in their own community, in one spring and fall. The loan material at the park increased its usefulness four times in the last three years. The Board of Agriculture has its exhibits showing the life history of insects, care of trees, and bulletins. The Commissioner of Forestry has pictures and pamphlets. Professor Collins, of the Forestry Bureau at Brown University, will present you with specimens

of the Chestnut bark disease. The Fish Commission has an exhibit which has been sent to the Panama-Pacific Exposition, why not use it at home? The Shellfish Commission will furnish shellfish of all kinds for nature lessons in the school. The Normal School has its loan material. There are people on all sides willing to help the children of the state to know these important questions of their lives.

The Nature-study Exhibit which was held at the time of the Institute was a revelation as to what is being done in the schools of the state in this line. Nearly every organization contributed something to illustrate what they were doing. One boy exhibited his potatoes and another a plate of ground almonds. If there are improved ways of raising the well known vegetables we want to know about it and if there are new crops that we can and should be raising in Rhode Island this is the way we can find it out. These exhibitions should be held oftener. We must assume that every teacher has some one thing that he is sure is a contribution to better teaching. He should be encouraged to exhibit and explain it. If each one will do his part the exhibit will become such an important clearing house and source of information that we will not be able to get along without it.

In closing, will say that I have tried to explain what Nature-study is and to name some of the nature values. Every community has its solid nature-facts. Recognize them. The many doorways to nature's granary are open. The opportunity is yours. It is our duty to help the child to face the facts of daily life, to open the windows to the substantial and progressive facts of natural science. Go forth and teach!



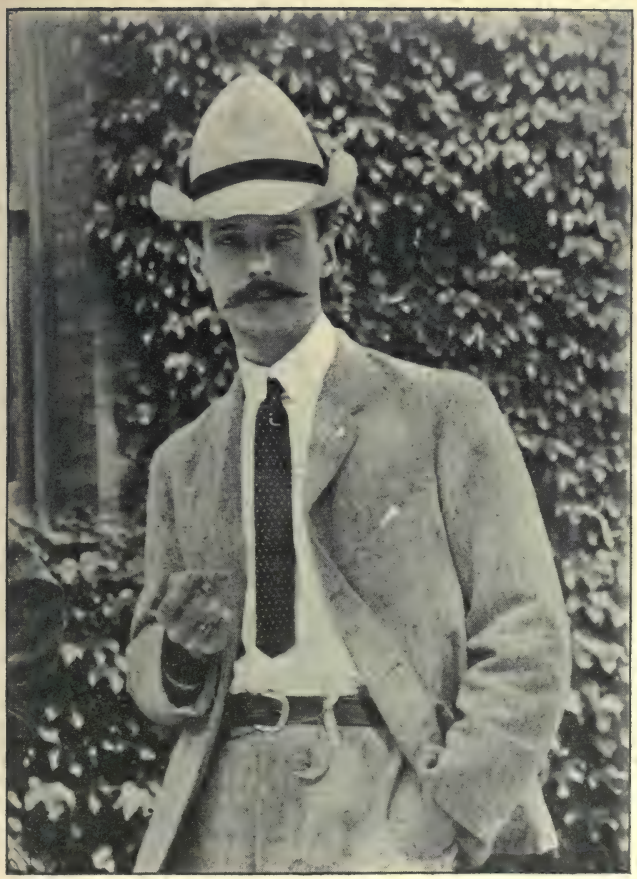


Photo Courtesy of N. Y. Zoological Society

MR. RAYMOND LEE DITMARS.

Curator of Reptiles in the New York Zoological Park. One of the foremost snake authorities in the country. Note the scarf pin—a rattlesnake fang.

The Copperhead Snake

An Interview with Raymond Lee Ditmars, Curator of Reptiles, New York Zoological Park.

GAYNE T. K. NORTON.

"So you want to know about the copperhead?"

Mr. Raymond Lee Ditmars, curator of reptiles in the New York Zoological Park, turned from his very business-like-looking desk and faced the writer, a twinkle in his eye. Mr. Ditmars is not a big man though he is strong and energetic, with keen eyes that see everything and a hand shake that is sincere; to meet him is to like him, and to hear him talk of snakes is a privilege, though he is not at all the sort of man one would picture as a snake hunter and fancier. His office, with its card indexes, letter files and stenographers reminds one more of a sanctum of an executive in a downtown skyscraper than the den of a naturalist opening onto a large room in which is exhibited probably the largest collection of snakes there is.

"Well, the copperhead snake is a good fellow to let alone; he is unsociable and his venom is deadly. They thrive in this part of the country and everyone, especially if they are in the open very much, should know something about this serpent. Their habitat is a large one; the eastern and central portions of the United States generally, from Massachusetts to the northern portions of Florida; westward to Illinois, and in the extreme south to the Rio Grande in Texas. The snakes seem to think the Palisades of the Hudson an ideal spot, suited to them in every way, and they are there by the score. I am watching that country constantly to prevent them, if I can, from forming into colonies and increasing too rapidly. Their presence there is a menace to the campers who, year after year, are increasing in numbers, as the Park Commission opens up the Park. New Yorkers a s a rule do not realize this and go on in blissful ignorance sleeping around and tramping about the woods, literally with their lives in their hands. I really cannot understand why there have not been more accidents than have been reported, for I know from personal experience that the snakes are there.

"As the copperhead is the only dangerous reptile in this immediate vicinity his habits should be studied, his paths avoided and

his presence and venom watched for and guarded against. This may all be done, practically, at the cost of but a few minutes' time, and it should be done. Vacationists prowl in the woods, very often in couples, and for them it is a 'safety first' precaution of no mean importance. The old adage that, 'an ounce of prevention is worth a pound of cure,' or, to make it fit the case, to know and avoid a copperhead is easier than to overcome the effects of its bite, is very true."

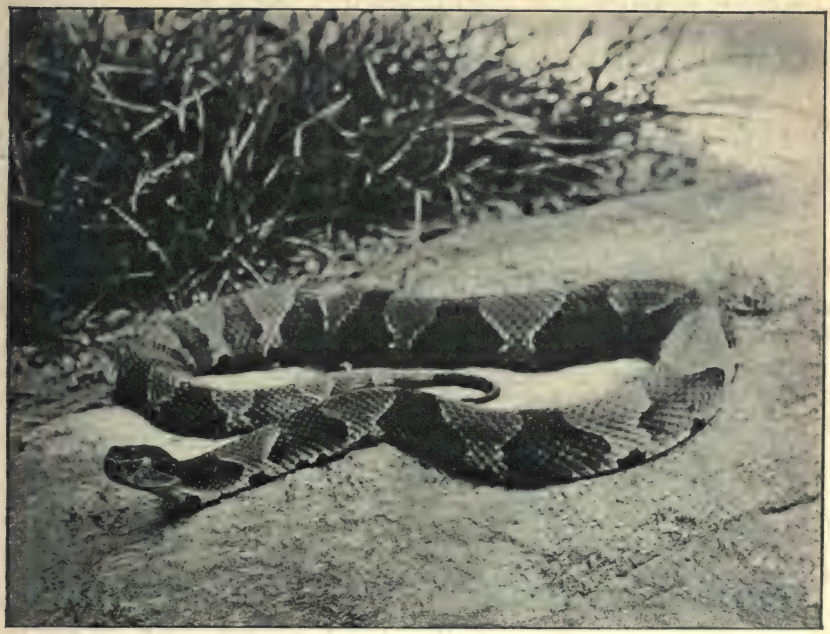


Photo by E. R. Sanborn, N. Y. Zoological Society
THE COPPERHEAD SNAKE

Mr. Ditmars warmed to his subject rapidly and of the vacationists he spoke with feeling, continuing, he said: "To know this serpent correctly it is necessary to climb his family tree, and in our climb we learn much of the other poisonous snakes for they have many characteristics in common.

"The family Viperidae is of moderate size. It is composed of about one hundred and twenty-five species, representing thirteen genera. The species are scattered over the temperate and tropical portions of both the Eastern and Western Hemispheres. The

Viperidae is divided into two sub-families, these technically termed the Viperinae (the True Vipers), the species of which are found only in the Old World, and the Crotalinae, or 'Pit Vipers', occurring in both the Old and the New World, but attaining their greatest size and variability of form in the latter. Thus, in North America, all of the thick-bodied poisonous snakes are 'Pit Vipers' or Crotaline serpents. The members of both sub-families may be recognized by the flat triangular head, very distinct from the neck and the elliptical (cat-like) pupil of the eye. The top of the head, with the majority of the species, is covered with very small, granular scales. Some show regularly arranged head shields of much the same formation and character as those of the colubrine snakes.

"The sub-family Crotalinae, containing the copperhead, the rattlesnakes, the moccasin and the 'fer-de-lance' has acquired the popular title for its members—the Pit Vipers—owing to a peculiar development seen with all the species. This consists of a deep pit, situated between the eye and the nostril. The orifice is lined with a delicate epidermis and connects with a well-developed nerve extending backward to the brain. That this pit is of some use to the snake, seems very probable, when the attendant nerve development is considered. Many investigations have been attempted, with the result of complicated anatomical repetitions in the line of description, but with no actual proof of the function of this organ.

Mr. Ditmars led the writer from cage to cage pointing out the pit in the heads of the various snakes; it is readily to be seen and forms a valuable identification mark. Speaking of the poison apparatus of the Crotaline snakes, he said "It consists of two long and hollow teeth—the fangs—provided with an elongated orifice at their tips for the ejection of the venom. These fangs are the exact reproduction, in hard enamel, of the hypodermic needle. It might be more appropriate to say that the needle was patterned from the fangs. The fangs are rigidly fastened to a *movable bone* of the upper jaw, and each connects with a gland, situated behind the eye, and containing the venom. When the mouth is closed, the fangs fold back against the roof of the mouth. As the jaws are opened, they spring forward, ready for action. The forcible ejection of venom from the fangs is caused by the contraction against the gland, of the muscles which close the jaws. The ejection of poison is voluntary, and unless the reptile so de-

sires there is no necessity in closing the jaws, to contract these muscles sufficiently to force venom from the glands. The fangs are covered with a sheath of thin and white, membranous flesh which is never withdrawn except during the act of biting." Mr. Ditmars illustrated by showing a pit viper's skull.

"The fangs are shed at intervals of about three months," he went on, "and by a neat provision of Nature the new fang grows into place *beside* the one about to be shed and becomes connected with the poison gland before the old fang becomes loosened. The

Photo from the Reptile Book,
Courtesy of Doubleday Page & Co.

SKULL OF HARMLESS SNAKE

The fangs are absent, the teeth too small to produce a dangerous wound. The teeth are so shaped that the engulfing process is rendered possible when prey, large in comparison to to the snake, is captured. Things will "go down" much easier than they will "come up."

old fang is shed by being left imbedded in the body of the prey that is bitten by the snake and is consequently swallowed with the prey. So hard is its composition that, although the bones, claws and even the teeth of the engulfed animal are entirely dissolved, the swallowed fang is unaffected by the action of the gastric juices."

The skull showed plainly several sets of auxiliary fangs behind the acting pair. This constant renewing of fangs proves that by removing the fangs a poisonous snake is not rendered harmless.

"In the act of striking, the jaws are opened and the fangs elevated to such an extent that their tips point almost directly for-

ward. In striking a perpendicular object the snake literally stabs with these teeth, instantly drawing back to a position of defence. In striking a small object or a rounded surface, the jaws close upon it enough to embed the fangs. So lightning-like are these movements that they are but a blur to the human eye.

"At most, the snake strikes about one-half its length when delivering an accurately aimed blow,and generally strikes a much shorter distance, in proportion to its length. Not unless frenzied does it strike a distance equal to two-thirds its length, and such blows are wild. *No poisonous snake springs bodily at the object of its anger,* such a feat is physically impossible."

The above facts, it will be remembered, are common to the poisonous serpents. The following remarks of Mr. Ditmars treat solely of the copperhead snake. The copperhead is known as the highland moccasin, pilot snake, rattlesnake pilot and chunkhead. The Copperhead is moderate in size and proportionately more slender than the water moccasin. The scales are strongly keeled, and the majority of the plates on the underside of the tail are in a single row. After examining hundreds of specimens Mr. Ditmars failed to find a single snake more than four feet long. The largest he captured was three feet, nine inches; it was taken in Georgia, near the coast, and is considerably larger than the average specimen. The following measurements might be considered those of a large example:

Total length	33 inches	
Length of tail	4½ "	
Diameter of body	1¼ "	
Width of head	1 "	
Length of head	1½ "	(or trifle less)

"The copperhead is readily recognized," said Mr. Ditmars, "by the markings. Above, the snake is hazel brown, with large cross bands of rich, chestnut brown; these bands are narrow on the back and very broad on the sides, and when looked at from above resemble the outlines of an hour glass. Beneath, the color is pinkish white, with a row of large dark spots on each side of the abdomen. From the sides, the majority of the bands appear as blunt 'Y's' with the stems directed upwards. On most specimens several of the bands are broken on the back, forming inverted 'V'- or 'Y'-shaped blotches on the sides. All the bands are darker at their borders, and with some snakes they enclose light patches of color that match the general hue of the body.

"The head is usually of a paler tint than the body—often showing a coppery tinge, thus the popular name. The upper lips are of a lighter shade than the top of the head, the line of intersection between the two hues beginning behind the eyes and extending to the angle of the mouth.

"The ground color varies into different shades of brown and gray, but the pattern remains strong and constant, though some copperheads found inland are dark with a faint pattern. When close-

Photo from the Reptile Book,
Courtesy of Doubleday Page & Co.

SKULL OF PIT VIPER

The active fangs are forced forward when the mouth is opened. Note the auxiliary fangs. The active fangs are shed periodically. The skull proves that a poisonous snake is not rendered harmless by the removal of the active fangs.

ly examined the majority of specimens will be seen to have the sides thickly powdered with tiny black dots. Some specimens from Ohio which I examined were a rich, dark brown, with little trace of the bands. Specimens from Texas had fewer bands which were wider, distinctly reddish and intensified by a whitish border.

"The tongue of this species is rather at variance, in color, with snakes in general. This organ is usually red at the base, with whitish forked section. It holds no 'sting' and is used for the same purpose as are all snake tongues—to feel and hear.

"While said to possess a most vicious disposition, the copperhead snake by no means displays more hostility than the other poisonous snakes. Like the moccasin, it becomes very tame in captivity, where it lives, thrives and breeds, showing more vivacity than the Southern snake, but a generally good-natured demeanor toward man. Often in transferring these snakes from cage to cage I have noted their evenness of temper; they soon accustom themselves to their new quarters, seldom strike and feed regularly, a sign among reptiles generally that temper and health are good.

"In the Northern States the copperhead frequents rocky places, usually near thick timber, marshy glades or hollows. Here they find much food in the shape of birds, small rodents and frogs. They also feed on other snakes. They often select deserted stone quarries for abodes, and hibernate in deep, rocky clefts. It is easily seen why the Palisades are infested. In the South, unlike the timber rattlesnake, the copperhead does not frequent the swamps and low grounds; it seeks higher ground.

"When disturbed in native haunts the snake usually tries to escape quietly. If flight be impossible it defends itself vigorously, throwing the body into a series of loops and striking in the direction of the enemy. At such times a rapid, vibratory movement is communicated to the tail which makes a distinct buzzing sound, if the snake is among leaves. Throughout all these moves the snake constantly backs away, always trying to escape.

Like the moccasin, if held down with a stick in an endeavor to effect its capture, it fights furiously thrashing the body about in an attempt to free itself. In its excitement it often bites itself, but these wounds are never fatal, as the venomous snakes are immune to their own and to each other's poison.

"I remember one experience with a large copperhead in the Pennsylvania woods. I was resting on a large rock, partially covered at its base with tangled vines. While carelessly swinging my foot against the vines I was startled by a buzz among the dead leaves, and glancing down I saw a large copperhead with head drawn back and tail vibrating, backing away by alternately looping and straightening its body. The snake could easily have struck my shoes. I remained motionless and in a moment it had glided away. Here was an instance of a poisonous snake, in a fine position to employ its fangs, giving warning of its presence and then retreating without delivering a blow. I brought that fellow home with me.

"The venom of the copperhead is said by authorities to be more violent than that of the moccasin. Small animals die more quickly from the bite of a copperhead than from the bite of a moccasin. The fangs are rather small in proportion to the size of the snake as compared with the majority of the Crotaline serpents, especially those of the warmer climates; this is also true of the moccasin.

"The fangs of the rattlesnakes are much longer in proportion to the general dimensions of those reptiles than with the two species mentioned. By this I do not mean to convey the impression that the copperhead is not formidable. It is a very dangerous snake, well able to cause death. The venom kills instantly, almost, frogs, toads and small animals. The copperhead makes an interesting captive, thriving under proper care, but I do not advise his adoption by amateur snake fanciers.

"The number of young produced by this viviparous snake is small, it usually varies from six to nine, the young being about ten inches long. When born the young snakes have brilliant yellow tails that look like grubs or maggots. When among dried leaves the young snakes blend perfectly, it is practically impossible to see them. They attract their food by moving the tail about and the ever ready jaws calmly await the approach of the unsuspecting wood frog. During the second year the yellow of the tail quickly fades, the Texas form being the only one to retain the greenish yellow tint through life."

Upon the treatment of poisonous snake bites Mr. Ditmars said: "Everything depends upon the promptitude in performing the first two precautions. First, apply a ligature a short distance above the bite, which is almost invariably on the arm or leg, without losing a second. Second, enlarge the punctures by cutting into them, at least as deep as they are. Make two cuts over each, these cuts crossing one another. This cutting starts the flow of the poisoned blood, which should be accelerated in every way. Much poison is drawn from the wounds by sucking. Wash the wounds clean and bathe them repeatedly in a solution composed of Permanganate of Potash crystals in water to produce a deep wine color. Above everything *don't lose your head or get frightened*, only give a little whiskey and get the sufferer to a doctor with all haste.

"For those who at any time or for any purpose venture into districts where poisonous snakes live, I have prepared a list of articles,

a sort of a first aid kit, that should be taken; the outfit takes little room and the articles needed in such a case are: Several good (very sharp) scalpels or lancets, a rubber ligature, a hypodermic syringe of fair size, a package of absorbent cotton, several yards of aseptic gauze, a few ounces of Permanganate of Potash (crystals), a small quantity of some antiseptic solution, and several sealed tubes of anti-venomous serum.

"The bite of the copperhead when sensible medical attention has been used has seldom proved fatal. Doctors are seldom at the scene of snake bite so the moral is, 'be prepared.'

Fish Culture in Ponds and Other Inland Waters, by William E. Meehan. Pp. 287. $1.00. Sturgis & Walton, New York, 1913.

This is primarily a brief manual of practical directions for fish culture by a man of much experience. There are only a few technical books on this subject so that this is rather unique in making easily available the approved methods of food and game fish culture. Teachers located near ponds and streams, who use aquaria, and those located in communities where there is much interest in inland fisheries, will find in this book much of value. In addition to the chapters on trout, bass, perch, catfish, etc., others are devoted to frog culture, the management of aquaria, and to goldfish.

The Travels of Birds, by Frank M. Chapman. Pp. 157. D. Appleton & Co. $0.40.

This small volume of a dozen chapters is designed as child's book descriptive of the wonders of bird migration. It contains many of Chapman's personal experiences in watching birds' flights, together with a wealth of fact stronger than fiction and all set down in a simple way quite within the comprehension of a few years old. There are "suggestions for study" at the end of each chapter that will stimulate observation and wider reading.

Elementary Science

JOSEPH B. SHINE.

The twentieth century child is bewildered and amazed at the complexity and efficiency of modern machinery. He wants to know: "What is that? What is it for? What makes it go?" So the demand for Elementary Science in the grade school is easily understood. Many say that the child should wait for his answer till he reaches high school. How many fail to get that far? Thousands and thousands fail to reach even the Ninth Grade and thus are shut out from understanding some of the commonest and most fundamental of nature's laws—laws which the future mechanic, the future electrician, and the future inventor must know.

What can be more interesting to the child mind than a vivid experiment explaining some of the questions he asks? Nothing will hold a child's attention better or excite his wonder more than a few practical experiments in Elementary Science. Wonder is truly the awakening of knowledge. But more than that, I believe that simple scientific experiments will make children *think* and they will make them *observant*. What study can promise more?

It was with an understanding of these principles that I began the following experiments at the McClellan School in Chicago. I realize that the twelve experiments I note here are not correlated and that they are not original. I claim neither point. However, I do know that they interested the children and made them think. Above all I tried to make them *simple*. These experiments are ones that any teacher can demonstrate and I know from actual experience that the cost of the apparatus is very small. If the children and teacher would bring some of the articles from their kitchens the actual cost would be less than seventy-five cents. If one wished to make the experiments simpler, at least twenty experiments could be made from the twelve I note here. The Principal of the Mc Clellan School, Miss Lilias M. Williamson,and our District Superintendent, Miss Ella C. Sullivan, are the pioneers in this work. District Seven in Chicago has a rapidly growing Science Club which is spreading the propaganda of vivid scientific experiments in Science for the upper grade children of the Chicago Public Schools.

EXPERIMENT ONE

In this experiment we proved that air pressure was a real force and that it would press in to fill a vacuum. Our apparatus was: A pint milk bottle, a hard-boiled egg with the shell removed, a match and some paper. The paper was lighted and then dropped into the bottle. After the heat had expelled some of the air within, we placed the egg in the mouth of the bottle. It quickly elongated and within a few minutes had slowly dropped into the bottle. It may take fifty minutes or three seconds for this experiment—all depends on the flame given off by the paper.

We believe that we showed by this experiment that air pressure was an active force and that it acted most rapidly when the vacuum was most perfect.

EXPERIMENT TWO

We sought in Experiment Two to prove the same principle as in Experiment One, only by a different way. Our apparatus consisted of a wine glass, some bits of paper and a match. We called it "The Cupping Experiment." I first bared my forearm and then dropped the bits of lighted paper into the wine glass. After they had burned for a few seconds I suddenly inverted the glass on the forearm. The bits of paper ceased burning immediately since the supply of air was exhausted. While the class watched my forearm both they and I were greatly astounded to see the flesh of the forearm rise fully a half inch into the glass. Fearing the rupture of a blood vessel, I attempted to pull the glass off but found that it resisted my efforts. After several violent pulls I accidently raised one of the edges of the glass and it came off without any effort. Afterwards, I used a piece of salt pork instead of my forearm and found that the results were just as good. I then explained to the class that the cupping glass was formerly used to draw blood to the surface and to draw pus from gangrenous wounds.

EXPERIMENT THREE

This is a chemical experiment. By it we proved that combustion ceased when the supply of air was exhausted. Our apparatus consisted of a pint and a quart milk bottle, a candle, and a match. When the inverted pint bottle was placed over the lighted candle, we found that the flame expired in ten seconds; but when the quart bottle was used, the flame burned for twenty seconds. Thus we established the fact that the life of the flame was proportional to

the volume of air. The children realized, too, that a room should be well ventilated, especially if many gas jets are burning. I explained to the children that a bird would die of suffocation, too, if given only a small volume of air.

About a week later the children told of a poor foreign family that had been wiped out because they were ignorant or forgetful of this principle. The burners of the gas stove and several gas heaters had been lighted, on a cool autumn evening, and the family were sleeping while all the windows were closed. The time was about five in the afternoon. Later, when some one called and forced the door, not only the family but also the pet house dog were found dead. The children unanimously agreed that an open window would have saved the lives of that unfortunate family.

EXPERIMENT FOUR

In this experiment and the two following we established the principle that heat was an expansive force. We sought to prove that heat would expand a liquid. A Florence flask filled with water and closed with a rubber stopper was used. A glass tube was thrust through the rubber stopper so as to project about an inch into the flask and extend about a foot out of it. The height of the water in the tube was marked with a rubber band. Then we heated the water with a Bunsen burner and we found that the water rose about an inch above the rubber band. If the water is allowed to cool it will drop back to its lower mark. This experiment illustrates the principle of the hot water heating system and ocean currents.

EXPERIMENT FIVE

We used two brass screw rings to show that heat will expand a solid. Each was screwed into a wooden handle. The smaller ring was of such a size that if it were one-sixteenth of an inch less in diameter, it would just slip through the larger ring. As it was, it failed to pass through the larger ring. However, when the larger ring was heated to a red heat in the Bunsen flame, it expanded just enough to allow the smaller ring to pass through. Then when water was poured on the larger ring, it contracted and the other ring could not pass through. Thus we proved the converse: that cold contracts. We also spoke of the expansion of rails, the Brooklyn Bridge, and even of our own bodies in summer

time. When our collars feel tight in summer it is because our throats are actually expanding. The wagon maker knows of this principle for he heats the iron tires for his wagon wheels and then when he has placed them on the rim of the wheels he tightens them by plunging the whole wheel in cold water.

EXPERIMENT SIX

To prove that heat will expand a gas, we used an empty Florence flask, corked with a single holed rubber stopper, through which a glass tube had been thrust. The end of the glass tube was then placed in a tumbler of water and the Florence flask (inverted) was heated by the Bunsen flame. As the air inside expanded it came out of the flask and bubbled up through the water. We then allowed the flask to cool; and many of the class were surprised to see that the water began to ascend the glass tube and fill up the neck of the Florence flask. Of course, it was the air pressure trying to fill up the partial vacuum which caused this phenomenon. I departed from this experiment to show that the movements of the air or winds were caused by unequal heating of the earth's surface. We then developed the thought of high and low pressure areas and explained that clouds were only masses of vapor. The explanation of rain, snow and hailstones can be very well given after this experiment is worked.

EXPERIMENT SEVEN

The apparatus in this experiment consisted of a Florence flask partly filled with water, a Bunsen burner, and some crystals of potassium permanganate. By means of these we endeavored to show the movement of heated water. When the water had been heated to a boiling point a few of the permanganate crystals were dropped in the water. The Bunsen flame had been placed just under the center of the bottom of the flask. We noted that the crystals went down the sides of the flask and ascended in the center. They traveled in circles. If their movement is shown diagrammatically on a blackboard it can readily be seen that the whirling crystals illustrate the movements of the land and sea breeze and of ocean currents.

EXPERIMENT EIGHT

This was an experiment to show that some metals are better than others for the conduction of heat. We preceded it by framing a definition of heat and by studying both the Fahrenheit and Centigrade thermometers. By very simple experiments we studied eight sources of heat: frictional, solar, terrestial, chemical, electrical and animal heat. We showed that percussion and combustion produced heat by hammering a wire and by lighting a candle.

In this experiment we used some sealing wax, ten marbles, a Bunsen burner, and a copper and iron wire. The wires were about one-eighth of an inch in diameter and a foot long. By means of the sealing wax we fastened five marbles to each of the rods. The first marble was placed two inches from the end, and the others were an inch apart. Then the rods were crossed and the two ends were held in the Bunsen flame. The heat, traveling by radiation, caused the two nearest marbles to drop off—one on each rod. Then as the heat traveled along the copper rod the wax slowly melted, and one by one, all five of the marbles on the copper wire dropped off. Only one marble dropped fron the iron rod. Thus the class concluded that copper was a better conductor of heat than iron. I explained that copper was used in electrical wiring because it was the best and cheapest for the conduction of electricity.

I departed from the experiment to say that air was a poor conductor of heat or cold and explained thus why feathers, furs, flannels, and even a blanket of snow are so warm. If a Thermos bottle is procurable, one can readily explain, at this point, that a vacuum (if perfect) will not conduct either heat or cold.

EXPERIMENT NINE

We sought to show by this experiment that heat is taken in whenever snow or ice melts. The class knew and were told nothing of latent heat. We used a tin cup filled with snow and a board partly covered with water. We placed the tin cup in the water and scattered common table salt (rock salt would be better) on the snow in the cup. Within ten minutes, although the room was warm, the cup was frozen to the board. The sides of the cup were covered with a light frost, and we sought the explanation for that, too.

When I asked where this principle was to be observed many mentioned the freezing of ice cream while others explained the "salting" of the points and frogs of railway switches. I insisted on a wider and commoner example, and one boy mentioned his mother's ice-box.

EXPERIMENT TEN

To establish the very common principle that evaporation cools, we used two thermometers and a few drops of alcohol. I used the school thermometer and a common ten cent thermometer. I placed them close together and noticed that both registered 72°. Then I saturated a small cloth with alcohol and poured a few drops of the alcohol on the bulb of the ten cent thermometer. I placed the cloth about the ten cent thermometer and proceeded to fan both thermometers with a fan of folded newspaper. I ceased fanning after a minute and noticed that the temperature of the school thermometer was 72° while that of the other was 62°. The temperature of the ten cent thermometer had dropped 10°.

We then asked for common applications of this principle. By a discussion, we found that our sprinkling wagons only lay the dust for a time although they do cool the air. We mentioned that it was usually cooler after a shower in summer. The commonest proof of this is of course our perspiration—which is only nature's way of cooling our overheated bodies. The breeze and the fan only accelerate evaporation. I told the class that New Orleans could make all the ice it chose by simply evaporating liquid ammonia. Thus by an apparatus costing only a few cents some of the most fundamental and interesting laws of nature can be made comprehensible to the twelve-year-old boy or girl.

EXPERIMENT ELEVEN

When I announced to the class that I would make water boil with ice the next time we met, they were suspicious of some trick. They wondered how it could be done. Since wonder is the beginning of knowledge, I thought it better to arouse their curiosity than to tell them that I would prove that the boiling point of water depended upon the force of the pressure of the atmosphere.

For this experiment you need a *round-bottomed* Florence flask, a tight cork, a Bunsen burner and some ice or cold water. We filled the flask one-fourth full of water and heated it till it began

to boil. Then we shut the gas off and corked the bottle quickly. After a minute or two, when I could take hold of the neck of the flask, I inverted the flask, holding it with a cloth, and poured some of the water and ice over the flask. Immediately the water in the flask began to boil. When we took the ice away the boiling ceased. When the ice was placed against the flask, once more the boiling commenced.

The ice condensed the vapor inside the bottle, and causing a partial vacuum, reduced the pressure. Since the boiling point of water depends upon air pressure, a reducing of the pressure allowed the boiling to re-commence. The teachers of geography can use this experiment to explain why it is impossible for the housewives of higher Colorado to boil navy beans, for instance. You cannot boil potatoes or coffee in the Himalayas because the boiling point of water is considerably lower than 212° Fahrenheit.

EXPERIMENT TWELVE

In this experiment we distilled water. The apparatus is too well known to need description. Any handy person can easily fit out the apparatus from the materials used in the previous experments. It would be well to place a little sand and salt in the boiler and test the distillate for them. In this way it can be proved that neither are to be found in the distillate.

The formation of clouds and the cause of rainfall can well be explained by means of this experiment. I have found that the majority of elementary school children believe that a cloud is only a bag of water. They explain rainfall by saying that two or more bags collided, and a cloud burst by explaiming that the bag of water was ripped open by a mountain peak. By this experiment they can see for themselves that a cloud is only floating steam—a fog, and the cooling of this vapor results in precipitation.

By observing the steam exhausts of neighboring factories the children found that it "rained" near them on cool days. By reading reports of our aviators and by watching them we can readily see that a cloud is not "a bag of water." A geography teacher can explain, too, that the aviators in Belgium were shielded and protected by the clouds (which prevail two days out of three) and they were not afraid of "bumping" into them or sailing through them.

September Nature-Study

ANNA BOTSFORD COMSTOCK.

Requests have come from many teachers to the author of the *Handbook of Nature-Study*, asking her to prepare a list of topics for a graded course in nature-study with special reference to this volume. There have seemed to the author many objections to such a course. If she were teaching nature-study, she would surely teach about the things she happened to find each day, whatever the grade she were teaching. The *Handbook of Nature-Study* was written with the idea that it would cover enough subjects so that the teacher might be helped in studying many common outdoor phenomena, and that is why there were 234 lessons written, when publishers and wise men declared a hundred lessons ample for any book. Moreover, 234 is an exceedingly small number of subjects on which to found a graded nature-study course. Mother Nature has provided at least two thousand subjects, all at hand and available.

However, because many teachers and also the pupils in my nature-study classes have assured me it would help them, I made this a part of the work of the seminar with an advanced class last year. I shall attempt to give in the REVIEW the outlines for the second, third, and fourth grades as thus worked out. I wish to express my obligations to Miss Anna Woodward, Miss Alice Snow, Miss Martha Whitworth and especially to Miss Adeline Thurston, now teacher of nature-study in the New Paltz Normal School, for their assistance in making this outline.

To avoid repetition, where there is no title given before a page reference, it will be found in the *Handbook of Nature-Study*. It may be noticed that only a few topics are selected for each month. This is to allow plenty of time for those lessons which the teacher herself may choose to give. Also, lessons will be outlined which are not in the *Handbook of Nature-Study*.

SECOND GRADE.

The buttercup—A buttercup plant potted and placed in the school room window is a most desirable assistance in this lessom which should be given early in September, while the plant is still blossoming. If a potted plant is not possible, there should be a bouquet of these cheerful posies brought in, which should show buds,

blossoms and fruit, and the variations in leaves. This will give material for three lessons: the plant and leaves; the blossom; the fruit. For the lesson on the plant, use *obs.* 7, 8, *p.* 530. For the lesson on the blossom, *obs.* 1, 2, 3, 4, *p.* 530. For studying the use of the fruit, *obs.* 4, 5, 6, *p.* 530.

The points to bring out in these lessons are: the variations of leaf forms on the same plant; the interesting little pocket for nectar at the base of each petal, and that each seed box or ovary contains one seed and that there are many of these;

The petunia—If buttercups cannot be found use the petunia. Use *obs.* 1, 4, 8, 9, 10, 11, *pp.* 642–3.

The morning-glory or the bind-weed—Some plants must have a support upon which to lean in order to flourish, and each species has its own way of clinging to its support. The readiness with which such plants take hold of an object or grow toward it so as to reach it, should convince us that the plants know what they are about. Either the morning-glory or bind-weed may be used to illustrate those plants that twist their growing shoots in a spiral around the support. Both these plants twist their spirals in the direction that the clock hands move or exactly opposite to the direction that the sun moves.

In teaching second grade children about either of these plants, the following observations should be made: How they climb, their petals are joined to form a bell, the color of the bell, inside and out; the five stamens with a nectary well between the bases of each two, the little seed box at the base of the bell, the time of day the flowers open, the way they close and when they close, the study of the sepals which act as blankets for the bud, and also for the seed pod. It should be explained that these flowers open just at the time of day that the insects which carry their pollen would naturally be flying. Colored crayon drawings of the flowers and leaves should be made. *Obs.* 1, 2, 3, 5, 7, *p.* 537. References: First Studies of Plant Life, *p.* 150; Lessons with Plants, Bailey, *p.* 396.

A crocus bulb—The planting of a crocus bulb in a garden or in a jar should begin with an examination of the bulb in which the

mother plant last spring stored enough food to enable the crocus to bloom next spring before its leaves have had time to make more food. The crocus bulb is an enlarged, underground stem, used as a food storehouse. This should be explained, and the pupils may each tell the story something as follows: "I am a crocus bulb. I am packed full of food that was made by the leaves of my mother crocus plant last spring after she had blossomed. All I ask is to be planted this fall, so that next spring I can use all of the food stored in me to make a beautiful flower and some green leaves to cheer all the little children who may look at me." See page 596.

The effect of light on plants—As early as second grade there should be a few experiments introduced to illustrate some simple facts in plant physiology. The use of the leaf as a starch factory making sufficient food for the plant and run by sunshine power, is one of the first lessons of this kind and may be illustrated as follows: Bring in a geranium from out of doors, pot it and place it in a window, never changing its position. Soon all the leaves will change position so as to face the light. This is an act that resembles actions of our own, and nothing is more important in nature-study than to make the children feel that a plant is a living being and always doing something. See second paragraph, *p.* 491. First Studies of Plant Life, Atkinson, *pp.* 136–149.

The position of leaves and flowers in the rain is another lesson of the same sort. Leaves and flowers droop, and many flowers close so as to shed the rain to escape the force of the pelting drops.

The effect of frost on leaves and flowers should be studied. Bring in the tender leaves and blossoms the morning after a heavy frost. First they wilt, and then they shrivel and turn dark colored. This is because Jack Frost destroys the walls and tears down the machinery of the leaf starch factories, and of course no factory can run without walls or machinery.

THIRD GRADE.

The geranium—The geranium is a cheerful companion of man. It is easily grown and its flowers render it most ornamental; it has a chummy quality that appeals to old and young alike. In teaching this lesson, a geranium plant bearing single flowers should be where the pupils may observe it. This will give material for five lessons: (1) The study of the plant should follow *obs.* 1, 2, *p.* 646. These questions should be asked one at a time, which the children

may answer after making observations. Each child should draw or trace a leaf. (2) The study of these flowers should fix in the child's mind the terms sepals and petals, which should be illustrated by talking about them thus: "This geranium has pink petals and that one scarlet petals, but they all have green sepals which wrap up the baby buds like blankets." Ask the questions from *obs.* 3, 4, 5, 6, *p.* 647. The nectar well in the geranium is wonderfully deep. It is the little knob almost at the base of blossom stem. A tiny grass stem or a slender needle may be pushed down the whole length of the stem to the nectar well. (3) The blossom of the geranium should be a matter of observation at least a week. Use *obs.* 8, 9, *p.* 647. (4) An outdoor study of the geraniums in their beds, noting the different colors, should be made to give the pupils an idea of the ornamental qualities of these plants. (5) Cuttings should be made and potted by the teacher or by a pupil in the presence of the others. For this, see *p.* 646, *obs.* 10, *p.* 647.

The black swallow-tail butterfly—The caterpillars of this butterfly may be found in all stages in September on celery, caraway, or parsnip. It is highly desirable to bring them in on the food plant in their early stages and watch their growth. A plant may be potted for their food in the school room; but the best way is to get fresh food each second day. The stems of the plant may be placed in a bottle of water and, with the caterpillar, feeding on the leaves, may be enclosed in a pasteboard box with mosquito netting over one side, which may be removed for the study of the insect. If this caterpillar can not be found, use some other; however, only the caterpillars of the swallow-tail butterflies thrust out sense organs when disturbed. A butterfly, also, should be captured and placed in the terrarium or in a box with flowers; a tiny vial, partially filled with sweetened water, placed in or near the flowers, will give the butterfly refreshment, so that the pupils can see the way it uses its thread-like tubular tongue.

This lesson naturally divides into three: (1) the caterpillar, use *obs.* 1, 2, 3, 4, *p.* 317–8. These questions should be asked, a few at a time, and the pupils allowed to answer at their leisure from

observation. (2) The pupa and chrysalis, *obs.* 8, 9, 10, *p.* 318. (3) The butterfly, *obs.* 1, 2, 3, *p.* 319.

An experiment should be made, attempting to feed the caterpillar on the leaves of some other species of plant than the one on which it was found. This experiment should not be carried too far because these caterpillars like all others will die of starvation rather than to take a bite out of a strange leaf.

While studying a butterfly in all its stages, the class should study the life history of some moth. It is best to get the fall webworms or perhaps a cecropia or promethea caterpillar or some species of woolly bear. The observations of the two insects may be carried along the same lines. The vital point of the lesson being, that the caterpillar of a moth always weaves about itself a silken cocoon before it changes to a helpless pupa; but the butterfly caterpillar never weaves a cocoon, but hangs itself up and molts, and hangs there in its "bare naked" pupa skin, until the winged insect bursts it open.

References: Everyday Butterflies, Scudder, *p.* 158; Moths and Butterflies, Dickerson; How to Know the Butterflies, Comstock; Moths and Butterflies, Ballard.

Cobwebs—A study of the cobwebs which the housewife tears down with her broom will lead to a respect for their builders. The lines are criss-crossed so as to entangle the blundering fly, and the lines that hold the web to the wall are fastened firmly. No other creature except man makes such delicate tapestries, or is such a clever engineer in building nets of silken ropes, as the spider.

Spiders are shy creatures and by no means dangerous. The bite of any of our common spiders is no more painful than that of the mosquito. However, the spider has such a soft body that it is much better caught in a box or vial than in the hand, if we wish to examine it more closely. The thoughts to be brought out are: the wonderful webs made of silk, the story of how the silk is spun, and the marvelous patience of the spider, after its web is made, in waiting for some unwary insect to come along and furnish it with dinner. Spiders are called blood-thirsty, but almost anyone would act that way if he had to wait a day or two or a week or two for something to eat, as is often the case with spiders. For studying cobwebs use *obs.* 1, 2, 3, 4, *p.* 476. The study of the general anatomy of the spider should be left for older pupils.

The grass spider—After the study of cobwebs follows naturally the study of the grass spider. This is the creature that builds the little funnel webs over the grass by the roadsides and in the fields. These webs on dewy and frosty mornings are very noticeable and beautiful. For the study of the funnel web, use Lesson CXI, *p.* 478.

References: Insect Life, *p.* 224; The Spider Book, Comstock.

FOURTH GRADE.

Dragon-flies—The dragon-fly is the insect aeroplane of the most powerful pattern, and is far more efficient than any flying machine ever invented by man. For this lesson, a living specimen may be placed in a tumbler or aquarium jar, and a study should be made of it as an efficient flyer. If it is impossible to secure living specimens, a pinned specimen may be studied for this part of the lesson. Questions in *obs.* 2, 3, *p.* 386, may be answered, and incidentally, such questions as are easily answered in *obs.* 1 may be asked. Pupils should be encouraged to note for themselves the flight of dragon-flies which may be found in numbers about marshes and banks of ponds and streams in September.

The outlines for field notes, given on *p.* 386, make an interesting study for a field trip with a class. If this is impracticable, there may be some of the pupils who would be able to make these observations and report to the class.

In the still pools of brooks or near pond margins may be found the young of the dragon-flies. They may be caught with a dip net by dipping deep in the muddy bottom among sticks and trash, or they may be found hiding under sticks and stones. Each dragon-fly nymph should be kept in a separate aquarium, for which a jelly glass may be used. These voracious little creatures may be fed by tying a fresh piece of meat or liver to a thread and suspending it near the bottom of the tumbler. This should be renewed each day, and the water changed often. There should be gravel at the bottom of the aquarium or a stone under which the creature may hide. Of course the dragon-fly nymphs may be put in a large aquarium, but they are the ogres of the water world and will kill almost any creature that they can overpower. These nymphs are small in September but may be found. However, May is the most favorable month for their study. Use *obs.* 1, 2, 3, 4, 5, 6, *p.* 385.

References: Manual of Insects, Comstock, *p.* 89; Insect Stories, Kellogg, *p.* 125 ("The Dragon of Lagunita"); Under the Open Sky, Schmucker, *p.* 189.

The sweet pea—This flower, carefully studied, gives the key to the flowers of all that important plant family, the Legumes, which include the clovers, the beans, the locusts, etc. It is a flower full of surprises. Its upper two petals, united, form a banner which it holds aloft, and which envelops at its base two nectar wells; it has two wings which hover over the keel protectingly and afford a pleasing resting place for bee visitors. The keel is a long pocket formed of two petals fastened together with one of Mother Nature's nicest seams. Inside the keel are nine stamens with the bases united into a case which surrounds the ovary that later develops into a pod full of peas. One lone, lorn stamen lies by itself just above the others and no one knows why.

When the bee alights upon the wings, her weight presses down upon the keel, and out of the keel, as smooth as silk, comes a mass of pollen, forced out and plastered on the bee by the unripe stigma, which has a little brush just below it.

The study of the sweet pea may be made in three lessons: (1) The bud and the flower, *obs.* 1–5, *p.* 651. (2) The fruit and its pod, *obs.* 6, *p.* 651, *obs.* 1, 2, *p.* 650. (3) The plant and the way it climbs, *obs.* 5, *p.* 651. The way the sweet pea climbs is most interesting, for it changes the leaflets of its compound leaves into stiff little tendrils which hold firmly to the trellis. The thoughts to be brought out in this study of the sweet pea plant are: compound leaves, some of them with leaflets changed to tendrils; the form of the flower; the form of the fruit and the way the pod opens to scatter it.

References: First Lessons in Botany, Atkinson, *p.* 185.

Sweet clover—The study of the clovers naturally follows that of the sweet pea. The sweet clover, either the yellow or the white species, may be taken first. The study of the sweet clover should be given in two lessons and one field observation which the pupils may make by themselves. (1) The plant, *obs.* 5, *p.* 657. The

foliage should be made the object of a drawing lesson. (2) The flower, *obs.* 7, *p.* 657. (3) The field work, *obs.* 1, 3, 4. The teacher should give a little talk on *obs.* 2; she can get the subject matter for this by reading *pp.* 652, 653, and 654. The thoughts to carry in studying the sweet clover are; its beneficence in preparing the soil for other plants; its flowers are arranged along the stalk one above the other, the lower ones blossoming first; the bees are very fond of these flowers.

The white clover—This should follow the lesson on the sweet clover. The thought to bear in mind is that in the white clover as in the red, the blossoms, instead of extending along the stalk, are telescoped into a close cluster, the outer ones corresponding to the lower ones in the sweet clover, and blossoming first; and as soon as a flower is fertilized, it droops below the flower cluster so the bees will waste no time upon it. The lesson on the white clover divides into three: (1) The study of the leaves and roots, *obs.* 1, 2, 3, *p.* 659. (2) The blossoms, *obs.* 4. (3) The study of an individual clover blossom in the school yard or nearby, *obs.* 5, 6, 7.

Following these studies of clovers, the pupils should be encouraged to bring in all the clovers of the region for comparative study. In almost any fields, roadsides, and woodsides may be found growing wild, the medics, yellow or hop clover, Buffalo clover, and often the pussy clover. Planted in the fields, may be found the red, the Alsac, the crimson clovers, and the alfalfa. These lessons on the clovers are very important as a preparatory work for elementary agriculture.

The verbena—A study of this pretty garden flower should be for the purpose of impressing upon the pupils the advantages of small flowers arranged in a cluster. Each of these flowers is too small to attract much attention if it were set on a stem alone, but several of them in a cluster make a great splash of color and so call loudly to the insects to come and visit them. Following observations may be made: The size of a single flower; the size of the flower cluster; the length of the stems of the flowers; on the outside of the cluster, compared with the length of the stems of the flowers at the center; and the adaptations of the stem to hold the flower in exactly the right position to make it form a part of the cluster. After the study of the verbena, encourage the pupils to find and name other plants that have this trick of massing their little flowers to make a great show.

FIFTH GRADE.

The parts of plants and their uses—The pupil should come to understand that the parts of a plant are as important to it as his mouth, hands, feet, stomach, etc., are to himself. The leaves make and digest the food for the plant, but they cannot make the food without the help of the sunlight. The stem or petiole of the leaf is for the purpose of holding it out to the light. The stem and branches of the plant are for the purpose of holding the leaves out where they may reach the light; and of holding the flowers up where they may be seen by the insects; and of holding the fruit out where the seeds may be scattered. The stems, branches, and petioles also contain the sap channels. The root pushes its way through the soil and takes up water, containing plant food, which is carried up through the stem. It also holds the plant in place. The flower is for the purpose of producing fruit. The seed is the whole object for which the plant grows and develops. *P.* 491–6.

References: First Lessons in Botany, Atkinson, *pp.* 40–70; Plant Notebook, Comstock, *pp.* 1–12; Plants and Their Children, Dana, *p.* 197.

The hollyhock—This is a special study of the relation of bees to flowers. The bees work so constantly in hollyhocks that they may be observed in any garden. The facts to bring out are these: When the hollyhock first opens, its many anthers form a knob at the center of the flower. At first its many stigmas are concealed at the center of the anther knob. Later, after the pollen has been shed, the stigmas push out like a fountain of spray from the tip of the knob. The nectar wells are situated, one between each two petals, at their bases, and are always overflowing.

The hollyhock "puts on a great deal of style" in the matter of sepals, for she seems to have two sets of sepals for every flower. However, we call the lower set bracts. How pretty the hollyhock buds are! The five sepals cover the delicate petals so closely that they seem to be sewed up in seams. Below these is a frill of bracts which may be five or more in number. Both bracts and sepals remain steadfast and become a part of the fruit. The sepals

grow over the ripening seeds and the bracts form a many-pointed collar; draw back the protecting sepals, and there are the little flat disk-like seeds, set in a row around a central disc. The bees are so devoted to the hollyhock that they often cuddle down in the closing flower and remain there all night; and it is impossible in an ordinary garden to keep the varieties pure. We started with five varieties in our garden four years ago, and the bees have hybridized them so that now we have ten or fifteen varieties.

The sunflower—This is the first lesson on the composites, those interesting flowers that live together in families. Those members of the flower family that cluster around the outside, wave banners to attract insects, while those at the center just attend to the business of ripening seeds. For this lesson get a large sunflower, just opened. Place its stem in a vase of water and have the pupils take notes each day on the process of blossoming. It takes a week or ten days for a big sunflower to blossom all its flowers, beginning at the rim and moving toward the center.

Pp. 631–5. Plant Notebook, Comstock, *pp.* 94–96.

The sunflower lessons should be six in number: (1) *obs.* 2, *p.* 364. (2) *obs.* 3. (3) *obs.* 4. (4) *obs.* 1, 5, 6, 7. (5) *obs.* 8. 9. (6) *obs.* 10. The notes for the entire week should be taken according to *obs.* 7. The study of the sunflower should form a foundation to the October study of the asters, daisies, and goldenrod.

The katydid or the snowy tree cricket—For the lesson on these little fiddlers, the live insects should be studied in the schoolroom. They may each be put separate in cricket cages, and fed with bits of fresh melon rind or of pears, sweet apples or peaches. For making cricket cage, see *p.* 375. The questions should be given out a few at a time for the pupils to observe at recess; or the cage may be placed on the desk of a pupil as soon as other lessons are completed. For the katydid lesson, see *p.* 320,—for snowy cricket lesson, see *p.* 377. For both of these insects, use *p.* 376, *obs.* 3, 4, 5; *obs.* 2,3, 4, 5, 8, 10, *pp.* 368–9.

References: Manual of Insects, Comstock, *p.* 113; Insects, Kellogg, *p.* 149; Ways of the Six-Footed, Comstock, *pp.* 18, 20.

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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Editorial

Two recent papers published by the General Educational Board are of sufficient importance in the teaching of science to deserve editorial comment in this REVIEW. The first is entitled "Changes Needed in American Secondary Education," by Charles W. Eliot; the second is "A Modern School,"by Abraham Flexner. I quote several sentences from various parts of President Eliot's paper which, coming as they do from so matured and revered an educator, are valuable commendation for the purposes of our Society.

"The most important part of education has always been the training of the senses through which that best part of knowledge comes."

"The difference between a good workman and a poor one in farming, mining, or manufacturing is the difference between the man who possesses well-trained senses and good judgment in using them, and the man who does not."

"It follows from these considerations that the training of the senses should always have been a prime object in human education at every stage from primary to professional. That prime object it has never been, and is not today."

"Many an elderly professional man, looking back on his education and examining his own habits of thought and expression, perceives that his senses were never trained to act with precision, that his habits of thought permit vagueness, obscurity, and inaccuracy, and that his spoken or written statement lacks that measured, cautious, candid, simple quality which the scientific spirit fosters and inculcates. Such a deplorable result ought not to have been possible; but it has been unavoidable by the individual, whether child or parent, because the programmes of secondary schools still

cling almost exclusively to the memory subjects and the elements of mathematics, and college students are apt to adhere in college to the mental habits they acquired at school."

"The changes which ought to be made immediately in the programmes of American secondary schools, in order to correct the glaring deficiencies of the present programmes, are chiefly: the introduction of more hand, ear, and eye work—such as drawing, carpentry, turning, music, sewing, and cooking, and the giving of much more time to the sciences of observation—chemistry, physics, biology, and geography—not political, but geological and ethnographical geography."

"It is not the secondary school alone which needs to be reformed—the elementary school needs to set a different standard of attainment, not lower or easier, but rather higher and harder—a standard in which the training of the senses shall be an important element."

"The devotees of natural and physical science during the last hundred and fifty years have not shown themselves inferior to any other class of men in their power to reason and to will, and have shown themselves superior to any other class of men in respect to the value or worth to society of the product of those powers. The men who, since the nineteenth century began, have done most for the human race through the right use of their reasons, imaginations, and wills are the men of science, the artists, and the skilled craftsmen, not the metaphysicians, the orators, the historians, or the rulers."

Mr. Flexner, in describing his modern school curriculum, says:

"The work in science would be the central and dominating feature of the school—a departure that is sound from the standpoint of psychology and necessary from the standpoint of our main purpose. Children would begin by getting acquainted with objects—animate and inanimate; they would learn to know trees, plants, animals, hills, streams, rocks, and to care for animals and plants. At the next stage, they would follow the life cycles of plants and animals and study the processes to be observed in inanimate things. They would also begin experimentation—physical, chemical, and biological. In the upper grades, science would gradually assume more systematic form. On the basis of abundant sense-acquired knowledge and with senses sharpened by constant use, children would be interested in problems and in the theoretic basis on which

their solution depends. They will make and understand a fireless cooker, a camera, a wireless telegraph; and they will ultimately deal with phenomena and their relations in the most rigorous scientific form."

In how far The American Nature-Study Society has been helpful in bringing about the appreciation of science as the core of the school curriculum may never be known, nor need we stop to quibble over such unimportant questions. We rejoice that the thing for which we have stood these many years is receiving commendation and support from such powerful educational agencies.

Book Reviews

Child Perceptions. By W. H. Winch, Pp. X + 245. Warwick & York. $1.50.

Mr. Winch has made a series of experiments with children of the English schools. The same picture was shown to each child and the child was asked to tell what he saw. Then the child was asked a series of questions in regard to the picture. A week later the child was again asked to tell what he had seen in the picture and answer the same set of questions. Finally the picture was shown to him again and the child was asked to put right what he had set wrong. The book is largely taken up with reports of typical replies and discussions of the results of the questions, and finally with a statement of the conclusions.

These are that (1) "The capacity to observe and report grades readily from the age of three up to the age of six or seven and then suffers a check." (2) "Children know more about their lesson a week afterwards than they do at the time, even when the period of observation is so short that the fatigue factor is excluded." (3) There seems an increasing resistance to suggestion, and an increasing capacity to observe clothing and the position of and the relation between things." (4) "Young children show very little accurate observation and memory of color. Only among the older girls (twelve to thirteen years) are the observations of color fairly full and good." (5) "Girls are more proficient than boys, both in the linguistic expressions of the observations and in the number and accuracy of them."

This is the sort of study that must go on extensively before we can have much real foundation for our programs in nature-study.

Being Well Born. Michael F. Guyer, Pp. 374. Bobbs-Merrill Co., $1.00.

Eugenics. Edgar Schuster, Pp. 264. Warwick & York.

These books are both able presentations of some of the best data regarding eugenics, and the viewpoint respectively of the American and English schools. The books are intended for the average person, not for the scientist, although many of the facts are necessarily expressed in more or less scientific terminology.

Dr. Guyer's book discusses hereditary characters and some general phases of the subject, then devotes considerable space to cell structure and the elements that are usually considered bearers of the heritage. Chapter three deals with Mendelism and the next chapter applies Mendel's Laws to man in so far as the data are available. Chapter five takes up the mooted question of the inheritance of acquired modifications, and concludes that such modifications are not heritable. Chapter six deals with prenatal influences and states the recently adduced evidence to show the deleterious effects of alcohol and venereal diseases upon the developing embryo. Three chapters are then devoted to a discussion of the inheritance of mental and nervous effects, and their structural foundation, while the final chapter gives the outlook and the eugenist's constructive programme. Dr. Guyer has accumulated a mass of fact bearing on the problems of eugenics which will be welcome to the average reader who desires to formulate an intelligent opinion upon the subject, and he shows quite clearly that there is abundant data now to justify a programme of education, some conservative legislation, and a hopeful outlook on racial improvement.

Mr. Schuster's book is a smaller volume, very readable. It does not present the matter with as great a wealth of fact. It reports naturally the English investigations and leaves out many of the American data. Otherwise it covers much the same ground. This book has an exceedingly interesting chapter, also, on the subject of eugenics in ancient times, showing that the idea is by no means new. Chapter three follows up the historical presentation with a brief biography of Sir Francis Galton, the founder of the English Eugenic Laboratory which bears his name. Chapter six is devoted to the statistical evidence of inheritance of which branch of the science Galton was an enthusiastic supporter.

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THE
NATURE-STUDY REVIEW

VOL. 12 OCTOBER, 1916 No. 7

October

L. H. BAILEY

On the hills the leaves are glowing
The summer greens have passed to red and orange
The October haze is on the fields
The sky is near
The sun lies deep and mellow in the trees
The winds have died and gone
The streams are still.—
The year is ripe.

I see the pageant along the countryside stretching away and away to paradise
There are queens and kings in purple and gold
There are strong good folk in green and buff and brown
There are vivid children in red and pink and yellow
There are miles of billows that roll their splendors over the hills
There are shadowy roads that lead far into the burning distances.—
My eyes are drunk with color.

Yellow and fiery-red are the maples
Red and morocco-red are the oaks
Nut-brown are the beeches
Golden-yellow are the gray-barked poplars
Straw-yellow are the grasses, and brown and sere are the weeds.—
Each kind has its color.

There are colors of the maple in the meadow and other colors of the maple on the hill
The oak one side my doorway is maroon-red and other side is veiny-yellow; and they have been the same in all the Octobers in which I have loved them.—
Each plant has its color.

Over the fields and in the swales I wander.
I push through the deep rustling leaves
Smell the weedy odor of the Indian summer
See the patches of sunlight drop through the shedding woodlands
Hear the solitary calling of the crow
Catch the last southward note of the bluebird

Hear the buzz of a passing fly and the drone of a friendless bee
Watch the cheek-full squirrel skitter along his fence-ways
See the quick scud of the chipmunk
I look for the rills that lead into the deep enchanted woods.—
I long to go where the nyssa holds its crimson and swamp-maple flames its scarlet.

Floating, sailing, turning, the autumn leaves drop one by one.
Content I sit in silence, and let the color fill my soul.
We all rest at last with the sad and silent noises of October.

Ye burning swamps and retinue
Of poplars gold and asters blue
That Fall hath drawn her fingers through
With red and flame and russet hue,—
I come to coin my day with you.

The streams are still
The year is ripe.

Principles Underlying the Organization of a Course in Nature-Study

GILBERT H. TRAFTON.
State Normal School, Mankato, Minn.

In a recent book by a well-known educational writer is found the statement that the leaders in nature-study do not agree as to what should be taught and as regards the principles to be used in the selection of material. Some such statement as this is sometimes given as a reason why nature-study is not introduced into schools. If this is true it is exceedingly unfortunate, but is it true? Is there as much disagreement as this statement implies? The writer believes not. There are certain principles which must underlie all teaching and these principles must apply to nature-study. And there are further certain special principles which must underlie all nature-study teaching, whether in Maine or in California. The particular topics taught must vary according to the locality, but the underlying principles must be the same.

To what extent do those interested in nature-study teaching agree on these fundamental underlying principles? In a recent issue of the NATURE–STUDY REVIEW, Prof. M. A. Bigelow outlines "Some Fundamental Propositions for Nature-Study" which are generally accepted by workers in this field. The writer finds himself in agreement with practically every proposition stated.

One particular phase of the nature-study situation which needs special consideration at this time is the organization of the course of study. In times past there have been those who advised that there should be no organized course, but that there should be a miscellaneous, unrelated, haphazard study of any materials that might happen to be available. The fallacy of such a position is so self-evident that it is not necessary to discuss it here. But the writer would like to raise the question: Are there certain principles underlying the organization of a course in nature-study on which workers along this line agree?

The writer would suggest the following propositions as a basis for a discussion of this question, which it is hoped will be continued in later numbers of the REVIEW. An effort has been made to separate those principles involved in the organization of the course from those involved in the teaching of nature-study.

BASIS FOR THE ORGANIZATION OF A COURSE IN NATURE-STUDY

1. The course should cover all phases of elementary science adapted to the grades. (Biology, hygiene, elementary agriculture, elementary physics and chemistry, astronomy.)

2. This material should be organized from the child's standpoint and not the adult's.

3. The basis for organization should be found in the child's needs and interests, instead of in the subject matter.

4. This basis should be found in the needs and interests of the child's present life or of his immediate future, instead of in those of the distant future.

5. The arrangement of topics should depend on the seasons.

6. The course should be adapted to local conditions.

7. In the lower grades the dominant purpose should be the esthetic; in the upper grades the dominant purposes should be the economic and social.

8. The topics for the primary grades should deal largely with the study of plants and animals; the work for upper grades should cover all phases of elementary science.

9. The topics for study in the primary grades should include the most conspicuous plants and animals in the child's environment, selected from the standpoint of color, activities, size, and occurrence.

The thought of the writer in starting this discussion is that others might contribute their views and that from these contributions it might be possible to select the ones on which all agree, not as a compromise, but as representing some of the essential principles underlying the organization of a course in nature-study. These must exist; have they been found yet?

Dr. L. H. Bailey has assembled the addresses delivered by him as president of the American Nature-Study Society and as vice-president of Section M (agriculture) of the American Association for the Advancement of Science, and another of similar character, and published them privately under the title "Ground Levels in Democracy." He offers to send the booklet free, as long as the supply lasts, to persons interested, upon application to his home address, Ithaca, N. Y.

DOUBLE-HUMPED CAMEL

The Humane Treatment of Animals in Zoölogical Gardens

R. W. SHUFELDT
(Photographs by the author)

Zoölogical gardens in large cities represent an institution dating far back into the history of not a few of the world's civilized nations, and they are to-day maintained in similar places on both Continents, as at London, Berlin, Melbourne, New York, and Washington, as well as in other large cities. There is every reason to believe that still others will be founded in the future, and managed much as they have been in years gone by; but with some improvement, it is to be hoped, derived from the teachings of modern zoölogical science.

Even in these days of advancement there are many who possess but very indefinite ideas as to the necessity and value of a properly sustained zoölogical garden as an educational factor in any large civilized community at the present time. As a matter of fact, however, the practical ends to be met by a large and varied collection of living animals, scientifically cared for in a sufficiently large area simulating their normal environment, are so far-reaching and important, that it would be quite out of the question to deal with them very fully in this article, which is to be mainly

devoted to the proper care of such animals, under the conditions we enforce in regard to them in their captivity. I would say, however, that an extensive zoölogical park of diversified topography, where forest, hillside, meadows, ponds, lakes, and streams have been preserved as far as possible in their natural wildness,—such a place, well stocked with animals from all parts of the world and of as many kinds as possible, constitutes an institution to meet various educational ends, the value of which it would be difficult to overestimate. The advantages that flow from the maintenance of such an institution in a civilized community can, as a rule, be useful only to the cultured and progressive elements in that community.

For many years past I have constantly studied the influence of a zoölogical garden upon the minds of those who visit it regularly or at varied intervals. This may easily be accomplished without your ever being suspected of making such observations, and the information thus obtained is well worthy of consideration. Fully seventy-five per cent of the visitors that go the rounds of a zoölogical park derive about as much benefit therefrom as they would by going to a circus; they pour in at one entrance and pass out at another, with no more information than they would have gained from witnessing the antics of the clown in the ring. Another percentage goes to the "Zoo" for the sake of amusement, which they get, in some instances, with a scant modicum of benefit of information. A still smaller percentage resorts there, not only for the purpose of seeing the animals, but to really learn from them what they can, under the conditions through which they are exhibited.

As a matter of fact, apart from a "Zoo" being a public amusement, it is too often the case that only the select few derive the benefit that these institutions are really intended to furnish. But then these few are worth the while; for they are of the scientific ilk, and they average only about one to ten thousand the country over. Perhaps those who derive the most benefit from a first-class and extensive zoölogical garden are the zoölogists who regularly visit it; next we have the anatomists and pathologists—provided the management admitted of the proper facilities for study. Then come the artists, sculptors, and photographers, who very often depend upon "Zoo" animals for their models and illustrations. Finally, there are the classes from the schools, and the

scholars attending constantly learn something from their visits there. So much, then, for the value of a zoölogical garden to society, to the community at large, and to science as a whole.

All this being true, it becomes a matter of the greatest importance as to how we should treat the various kinds of animals in a zoölogical garden—be its size what it may. It is to be presumed that the manager of such a place not only fully comprehends what his position calls for in the way of the proper keeping of its denizens—in the broadest sense as well as in detail; but it is likewise to be taken for granted that, in his care of the animals, and in the orders he issues to his subordinates, he does all in his power to have each and every animal in the garden and under his care as comfortable and contented as possible. For one reason or another we occasionally meet with exceptions to this; but in general the superintendent of one of these institutions is all that he should be —a man fond of animals; in the possession of a full knowledge of how to care for them in captivity, and employing this knowledge to the best ends. He is generally an all-round zoölogist, familiar with the lives that the world's animals lead in nature, and he puts this information to the best possible uses, with respect to the care of those under his control in the zoölogical garden of which he is the superintendent.

Apart from their species or kind, animals of every description fall into numerous classes, and the needs of these classes in captivity must be met as nearly as possible—or at least as nearly as the means at our command will permit. When I say apart from their species or kind, I mean that, everything else being equal, such an animal as one of the small, active monkeys for example require very different care and management than does a woodchuck or a badger. When in summer quarters, all of the small apes and their near congeners should be kept in an immense out-of-doors cage, in which should be growing several large trees, in order that these animals may get, as nearly as possible, the exercise they are accustomed to in nature. On the other hand, a badger or a wood chuck is quite satisfied, winter and summer, with a suitably located patch of ground of no great area, and, if needs must be, treeless.

The classes referred to, then, take more particularly into consideration animals that have been captured in their native haunts and transferred to zoölogical gardens. They may be of two classes or rather subclasses,—that is, animals brought from dif-

ferent foreign countries, far from the zoölogical garden for which they are intended, and animals that are indigenous forms, captured practically in the same locality where the zoölogical garden is located—at least very near it. Two more classes spring from these again; either may bear young in captivity, and these grow and develop under conditions which have always been the same for them, as they have never known what freedon in the outer world means. This is very well exemplified in the case of lions and tigers, and many other mammals.

Some captured birds pine away in a short time, while the young of the same species, bred and reared in the cage, will thrive well for many years, apparently enjoying themselves just as though they were free. Young bobolinks, reared from nestlings, often do much better in cages than do old birds taken in traps. Animals coming from different *latitudes* form another class with its subclasses, such as polar bears and northern species of seals kept in zoölogical gardens situated in the tropics. This can often be successfully done under proper management, as in the case of the polar bears now living in great comfort in the Zoölogical Gardens of Melbourne, Australia. This is doubtless due to the fact that Mr. Dudley Le Souëf, the Director of those beautiful gardens, thoroughly understands the methods of successfully keeping all kinds of animals in captivity; the records of his gardens stand for the fact that he constantly employs that information to the best advantage.

Taking animals of all descriptions, and of all of these various classes, one would be much surprised at the length of the list of things they miss—or must endure—while leading a life of captivity, whether the particular garden be situated in the tropics or in the temperate zone. To a large class the loss of liberty means much—often up to the very time of death. Complete changes in food, in environment, and in other conditions constitute hardships of various degrees of intensity. Some animals are gregarious in nature, often consorting together in immense flocks, bands, or herds, and they never become entirely inured to the loss of such companionship. There are many other restrictions due to cramped quarters, and to the loss of nearly everything they hourly enjoy in nature; indeed, privations of this kind are too numerous to list in the present brief article on the subject.

For many years I have, from time to time, paid very considerable attention to the care of animals in zoölogical gardens, and I am convinced that many of the deprivations mentioned above can, in some instances, either be very much mitigated or done away with entirely. Had all animals the power of speech, it would be most interesting to hear what some of them would have to say in regard to these matters; but a few of these conditions are quite beyond the pale of remedy. It is, for example, out of the question to gratify the instinct of certain mammals or birds to herd or

White Pelicans

to flock; but sometimes it is possible, as one may see in several instances in the National Zoölogical Park at Washington, to gratify this yearning in birds, as shown in one of my photographs here, where upwards of a dozen beautiful, white pelicans are enjoying themselves on the shore of a natural pond. Some of the geese and other water fowl in that Park are given similar advantages, while it would be impossible to undertake such a scheme in the case of many of our mammals.

In very extensive parks, there is no reason, when such institutions are sufficiently strong financially, why they should not give certain animals all the room and natural environment they

may need to make them as comfortable and as contented as possible. There are several good examples of this feature being carried out under the management of the National Zoölogical Park, however, and an excellent example of this is seen in the case of the double-humped camel, which is illustrated in figure one of the present article, it being a reproduction of a photograph of mine. In the distance, we may plainly see in this picture an old, male yak —another mammal which has been allotted, in this Park, a large area to roam over. Nevertheless, there are not a few animals in this place that severely suffer from being continually confined in cramped quarters; but of these I shall give examples at some other time, when this matter is taken up again.

Introduction to Neurology. C. Judson Herrick, pp. 355. W. B. Saunders Co. $1.75.

A few sentences from the closing paragraphs of the work indicate why the discoveries of the student of the nervous tissues are of such interest to the educator. "The educational period is limited to the age during which the association centers, whose form is not predetermined in heredity remain plastic and capable of modifications under environmental influence. Ultimately even the cerebral cortex matures and loses its power of reacting except in fixed modes." This quotation is from the last chapter on "The Evolution and Significance of the Cerebral Cortex," a consideration of which is giving us one firm basis (the other is experimental education) for educational procedure. Much of the book is tough reading for the layman for it is intended to guide the student of the nervous system in his anatomical and histological studies. But it is worth wading through it to get the foundation for appreciating such chapters as the one cited, the XVIIIth on Pain and Pleasure, the XXth on the Functions of the Cerebral Cortex. The very full index and glossary make it easy to look up special topics in which one is from time to time interested.

Free Rural Literature

If any of our readers are looking for helpful free rural literature, they should write to Garland A. Bricker, Professor of Rural Education and Agricultural Teaching, College of Agriculture, Syracuse, N. Y., who is sending out information on authentic matter. The information is free, but a one-cent stamp should be inclosed to pay reply postage.

The Beech Tree

CLEORA M. DECOSTER.

NATURE-STUDY IN THE KINDERGARTEN.

If nature-study is merely observation and does not lead the child to think, it fails in its greatest essential as an educational factor. The seeing of things should lead to thought and should foster greater interest. With the small child in kindergarten or in first grade this can best be accomplished by supplementing the observations with a story. During the summer sessions at Cornell University there is conducted, in connection with the nature-study courses, a kindergarten seminar. The members of the seminar are mostly experienced kindergarten or primary teachers or those who are fitting themselves for this work. A part of their training consists of outlining plans for presenting various nature-study topics and in writing the supplementary stories. Miss DeCoster gave to the class the following presentation of the beech tree, which, as a type method, will, I am sure, prove helpful to any teacher of little children.

It is Dr. Downing's plan to have in each number of the REVIEW this year, some work of this kind for the help of the primary teachers.—A. B. COMSTOCK.

IF possible the children should visit a beech tree several times during the year, once in the fall to see the nuts, burs, and falling leaves; again in the late fall or winter to see the bark, limbs, twigs, buds and general shape of the tree; and in the spring and early summer to see the unfolding leaves, the blossoms, and the full-grown leaves.

Observations to precede the story of the beech nut—The children should note: The rough outside of the bur and its smooth inside lining; its four open doors to let the nut drop out; the way the two sister nuts are cuddled together in the bur,—the two flat sides together; the shell of shining brown; the place where the nut is attached to the bur; how many sides the beechnut has; open a nut and note that its meat is enveloped in a silken cover; the sprout at the tip while the remainder of the meat is the lunch put up by the mother beech tree for the baby nut when it starts to grow.

INDOOR LESSON ON THE BEECHNUT, WHICH TELLS ITS OWN STORY

"I am a beechnut. See my smooth, brown three-cornered shell. Do you know what is inside of the shell? Yes I am very good to eat after my shell is taken off. My meat is so sweet that both people and animals like it and use it for food, so you see I am some good in the world. Would you like to know where I grew? John brought me to school. Perhaps he will tell you where he found me."

John answers that he found it under a big beech tree upon the hill.

"I will tell you how I came to be there on the ground under the tree. Last spring, when the leaves came out on the tree, I was down inside a little green blossom, so small one could hardly see me away up on the top branch of that big beech tree John found me under. One day the wind blew some pollen from another blossom to me. Then I began to grow. I had a little twin sister, exactly like me, and we were tightly packed inside a little green prickly bur. We could not even see out. Nothing could harm us for our prickly bur kept us safe, and no one but the birds came near us up there among the leaves. But the sunlight shone on us and we grew and grew. As fast as we grew our little bur house grew too, so there were we shut fast inside, more snug than the beans in a bean pod. After a long time the night began to get colder and we stopped growing. One very cold night Jack Frost came and opened our bur house, so we could look out. From up in the top of our mother tree we could see all over the hillside, for we were very far above the ground."

"We saw a lot of our sister beechnuts looking out of their bur houses too, and saying good morning to us. Then the wind began to blow and shook our branch. Our bur house was open and couldn't hold us in, so we fell out and tumbled down through the branches to the ground. But our fall didn't hurt us for we had such hard brown coats. I lost my twin sister, but I found a lot of other sisters on the ground that had fallen too. In a little while a chipmunk came along picking up nuts and stuffing them in his cheek pockets to carry away to his home for food in the long winter. But he didn't see me. A red squirrel came too, and ran right over me. The next day some boys and girls came to gather beechnuts. John found me and here I am. I am glad he didn't eat me, for I should like to be planted in the school yard."

"My nice sweet meat is really a little seed, and if you should plant me this fall, next spring I would come up and grow, and if you took good care of me, I would sometime become a big tree like my mother. Then boys and girls could play in my shade, and climb me and gather my nuts. Will you go up on the hillside and see my mother tree? Then you will know how I shall look when I am grown up and then you will want to plant and care for me."

Observations to precede the story of the beech tree—The beech leaves should be pressed and mounted on a card or they may be traced on paper to impress upon the child's mind that they have toothed margins, straight veins, and a short leaf stem. Note the smooth bark of the tree which is usually dappled light and dark gray; the light gray color of the smooth branches; the long, thin, smooth, pointed buds which hold next year's leaves.

OUTDOOR LESSON FOR LATE FALL OR WINTER—THE BEECH TREE TELLS THE STORY.

"Good morning, children," says the beech tree as she nods her branches. "I am very glad to see you again. You see I have lost my green summer dress and am ready for the cold and snow. If I kept my leaves all winter the snow would pack so heavy on them that its weight would break my beautiful branches. Do you not think my gray bark is very beautiful? Feel how smooth it is, and see the spots on it. I think it is a very neat dress and I think I am quite as pretty as I am with my leaves on. See how tall and strong I am. My wood is very hard, and my branches very strong. See how graceful they are as they sway in the wind."

"I kept some of my yellow leaves on for I like to hear them rustle in the breezes. Just listen to them. When the snow comes I shall have to let most of them go. But I shall have some new leaves early in the spring. I have them all ready; can you find where they will grow? Are they not beautiful buds, so long and slender? See how tightly their scales overlap like shingles. They keep the cold and snow and rain from getting inside to spoil the little young leaves all folded up there. As soon as it gets warm in the spring the little leaves all folded up will grow and push the scales off."

"I see you like to walk about on my leaf carpet. My leaf carpet protects my roots and also hides some of my nuts that the squirrels didn't find. The nuts will sprout next year and become tiny trees."

"Have you visited my sister trees here on the hillside? They will be glad to see you. All of us beech trees look very much alike, so you can tell us from other trees. I have three sister trees near. See if you can find them all. Come again in the spring and I will show you my blossoms and let you see my leaves unfold and grow."

Let the children all say good-bye to the beech tree and promise to visit her in the spring.

I. View of Garden Soon After Planting

An Indoor Garden

Elizabeth D. Wuist, Ph.D.

A school garden is a very important factor in Nature-Study and the fact that there is no available space in the school yard need not discourage the teacher, for an indoor garden is not only possible but may be made fairly successful. Although an outdoor garden is to be preferred yet an indoor garden offers some advantages over the former as it can be started early enough in the school year to give the children in most cases the opportunity of following the complete life cycle of the flower or vegetable which has been planted. In this way the garden may become the nucleus for a complete course in Nature-Study.

The plan for the garden here described was successfully worked out, under my supervision by Miss Pearl Elger, a student in the advanced course in Nature-Study at the State Normal School, Milwaukee, Wis. As we were fortunate enough to have a greenhouse twenty by eleven feet at our disposal the garden was laid out in the trough along the south and west side, thus it received light from the sky light and from a series of windows on the west and north sides. The trough was four feet from the floor and had a depth of six inches. The greenhouse was heated by steam, therefore, the temperature was more or less uniform, although in windy weather there was considerable variability which proved a benefit rather than a hindrance for the growth and development of the plants.

As Miss Elger was especially interested in model school grounds a complete school ground, including yard, playgrounds and garden were included in the plan. It was decided, owing to lack of room, that the entire space devoted to the school grounds should be divided as follows: yard proper 2 ft. by 1 ft. 8 inches; playgrounds 2 ft. 6 in. by 1 ft. 8 in.; garden 5 ft. 3 in. by 1 ft. 8 in.

The trough was filled with rich loamy soil and cultivated with small tools until it was very fine. The plots were laid off and raised about 2 in. A space of 2 in. was left between each plot to represent paths. Only one vegetable seed and in most cases only one flower seed was planted in each plot. A plot, along the wall, 2½ in. in width and extending almost the whole length of the garden was devoted to sunflowers and morning glories; the latter were trained up on strings fastened to the wall. A trellis, with a grape vine was represented at one end of the garden by twisting a piece of a wild grape vine around a frame. The strawberry plot was planted with a wild strawberry plant although later a cultivated variety was substituted. Cuttings of currant and raspberry bushes were placed in wet sand until the leaves began to unfold when they were placed in the garden in the plots assigned to them. Small branches of Arbor Vitæ were used to form a hedge separating the garden from the school yard, and to illustrate a wind break for the garden. A small schoolhouse constructed of pasteboard was placed on a stone foundation in the center of the school yard, while a miniature bird house constructed of paper was erected near by. Two flower beds were made on the east side of the schoolhouse. On the one was placed a narcissus and a hyacinth bulb. These were later replaced by asters. The other flower bed was devoted to a pansy and a poppy. Wild flowers, hepaticas, spring beauties from the woods were planted close to the hedge so that they would be slightly protected. Branches of the desired trees and shrubs were placed, each in a separate bottle of wet sand and these bottles were buried in the soil wherever it was decided that a tree should stand. The following trees and shrubs were used and proved satisfactory for this purpose: box elder, red maple, elm, oak, lilac, spireæ, forsythia and snow ball.

The playgrounds were sanded and miniature apparatus set up.

It is hardly possible that public schools would have a greenhouse but that fact need not prevent the successful working out of a modification of this general plan. A sand table, long boxes or even

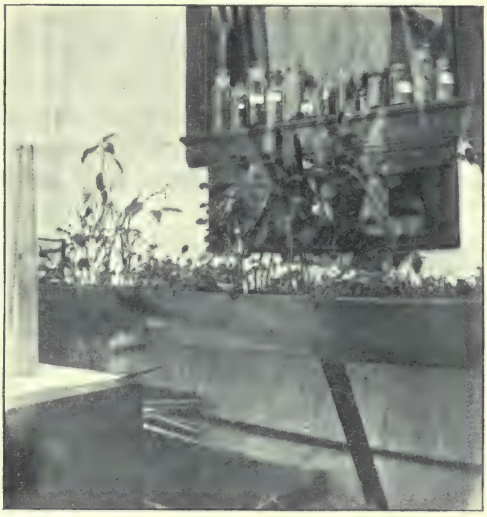
a temporary table constructed by laying boards across two horses with a board fastened along the edge to prevent the soil falling off and covered with oil cloth, may be used. The size should not be less than 10 ft. long by 1 ft. wide and at least 6 in. deep. The height of the table or box from the floor depends upon the height of the windows from the floor. It should be as high as, or a little higher than the window sills.

The location depends upon the window space avilable, how the windows fit and the method of heating the rooms. This is especially important if the garden is started in the winter. If the room is evenly heated the location does not matter so much as long as the plants receive sufficient light. A few suggestions in regard to the development of an indoor garden in the grade schools might be helpful to the teacher. Before the soil has been provided for the garden, the teacher should give the children a few simple experiments using sand, clay and loam to demonstrate the kind of soil which it is best to use in a garden. Elementary lessons on seeds may then be taken up in such a way that the children will learn the parts of the seeds, their uses and the conditions necessary for germination. These lessons should be followed by a lesson on the comparative size of seeds, and the proper depth for planting. The latter can be readily demonstrated by filling a bottle or glass jar with soil and placing the seeds at different depths next to the glass; then wrapping the bottle in black paper so as to exclude the light. The growth of the seeds may be studied from day to day (p. 26, fig. 16 School Exercises in Plant Production, *Farmer's Bulletin 408*).

The children are now ready to plan their garden. This plan must be worked out in class; the children suggesting the things which they desire to have in the garden and the amount of space that will be given to each. The value of these suggestions may be decided by the pupils and the teachers and the plan made accordingly on the blackboard. If it is advisable to select only the common vegetables and flowers, the teacher can represent the flowers in colors on the plan so that a degree of harmony in color is secured. After the plan has been worked out carefully, a drawing of the final plan made on a definite scale should be placed on the blackboard for future reference. If blackboard space is not available a large sheet of cardboard may be used. Each child should provide himself with a notebook for keeping records of the various seeds, their time of planting, length of germination period

and the manner in which the seedlings come through the ground and the parts first seen, etc. A copy of the plan of the garden may be placed in this book. If small garden tools are provided the children may aid in the construction of the garden, in the case of older children they can do all the work. This will give them a personal interest in it.

After the garden has been made, the Nature-Study lessons may be devoted to a study of the care of the garden, the eradication of weeds, the importance of toads, birds, spiders, good and bad insects



II. Garden After the Plants had Developed

in a garden. In the advanced grades lessons on layering and cuttings could be worked out. Other studies such as, reading, language lessons, drawing, and geography may be correlated with the Nature-Study lessons and in this way interest in these subjects may be greatly stimulated. Likewise, the children and through them possibly the parents, will become interested in having outdoor gardens of their own. Teachers will find the following books and pamphlet of use in planning either an outdoor or an indoor garden: Nature-Study—Fred L. Holtz, The School Garden Book, C. M. Weed and P. Emerson. "School Exercises in Plant Production,' *Farmers' Bulletin 408.*

Nature-Study in the Primary Grades

ROBERT CUNNINGHAM MILLER

I envy the teacher of the primary grades. Her task is great and her trials are many, but for gaining an appreciation of Nature, her situation is ideal. John Burroughs says:

"I have thought that the boy is the only true lover of Nature, and that we who make such a dead set at studying and admiring her come very wide of the mark. . . Certain it is that we often get some of the best touches of Nature from children."

It is surprising what close observers children are, and how readily they pick up bits of information about the interesting things around them. They know where the Bluebird makes her nest in the hollow tree; they know where the first spring violets grow. And what delight they take in telling about it! Give us teachers with a genuine interest in Nature-Study, teachers who will lead their classes back to the heart of Nature, and the whole puzzling problem of Nature Teaching in the schools is solved. The children will teach themselves, and they will teach the teacher.

We need not go far in quest of subject matter. Enough of Nature is visible from the school-room window for centuries of study. If the outlook is upon a barren city street, hold night-school now and then and study the stars. They are visible alike from town and country, and the children never tire of watching them and picking out the Great Bear and the Little Bear and the Dog Star, and Orion, the fabled hero of old.

The great Agassiz held Nature-Study classes in the loft of a barn, and a barn is still a good place to study Nature. If the swallow's nests under the eaves are inaccessible, don't knock them down with a pole to see if there are any little swallows inside. Let them alone and begin your studies on the first floor, where the cows are kept. The cow is just as much a part of Nature as the wood-mouse or the squirrel; she is just as interesting and certainly she is a great deal more useful. If you do not think the cow an ideal subject for study, read "Our Rural Divinity," a charming sketch in which John Burroughs has immortalized the cow and, we are safe in saying, the cow has immortalized John Burroughs.

For a start in bovine research, how many upper incisors does a cow have? Compare her in this respect with a sheep and a goat. How does a cow get up? Contrast her method with that of a

horse. A thousand other questions will suggest themselves. Study the personality of the cows that come under your observation. No two cows are alike; all possess individuality. We used to have a cow that would never drink unless she were allowed first place at the trough. Another, the personification of Wall Street finance, would reach over and steal all her neighbor's hay before beginning on her own. And so on *ad infinitum*. Study the commonplace things, and you will find that nothing is commonplace. You will soon come to feel that the word should be blotted out of every dictionary and forgotten. God never made anything common. A gnat is as wonderful as the universe.

This is not written to be startling or unique. It is genuine Nature-Study, as useful and practical as it is interesting and delightful. Learn to appreciate the beauty of the things around you and you will be able to lead the children entrusted to your care in paths of pleasantness which they will follow with ever increasing delight all their lives.

The duty of the teacher is not to tell, but to explain. Imagine, if you can, a teacher standing up before her class and *telling* them spelling or arithmetic! The child is supposed to have sufficient mentality to gain his knowledge from the textbooks and the work of the teacher is to aid and explain. Then why in the name of common sense do we cease the parallelism when we come to Nature-Study? The nearest wood-lot is a text book, written with the finger of God, and written so simply and so well that the child and the grandfather may study there together and each be interested in what the other reads. The highest duty of the teacher is to open the great Book of Nature to the title page, where the nodding flower and the rippling brook and the singing bird will entice the children into the beautiful mysteries beyond. Then let them study the wonderful volume page by page, as Autumn merges into Winter and Winter gives place to sunny Spring again. The teacher's task, as in any other subject, is to guide their studies and explain, when she can, the knotty problems which are continually coming up. Many of them are inexplicable. Why does the screech-owl change its plumage? That is only one of the thousands of things we do not know, and concerning which ignorance is no disgrace.

Bird study will appeal to children perhaps more than any other branch of Natural History, and this interest should be encouraged

in every possible manner. In the spring, when the birds are returning from their southward journey, it is a very good plan to devote a part of the blackboard to a bird calendar. With the aid of a yardstick a few lines may be drawn and the board divided into columns in which to record the name of each bird and the date of its appearance, together with the name of the pupil by whom it was first reported. This stimulates a healthy interest in watching the birds, as everyone wishes to see his name on the board in connection with a bird which no one else has seen.

Let the teacher do a little personal study herself. The children are always interested in any little anecdotes the teacher may tell, particularly when they relate to something she herself has seen or done. We all listen with more interest to the man who tells his own experience than to him who relates the experiences of some one else, and children are no exception to the general rule. When we have succeeded in bringing the personal element into Nature-Study, so that teacher and pupil listen to each other with the same interest and both are seeking some new wonder of the Great Outdoors to tell the other, we have achieved true success.

Introducing Nature-Study into the school brings perhaps added burdens to the already busy teacher, but after all it is well worth while. Our very existence is closely interwoven with that of the world, animate and inanimate, around us and no education is complete without a knowledge of our relation to this sphere on which we live. The writer has a right to be enthusiastic over the subject, for he was a "victim" of Nature Teaching in the public school. History and geography he has largely forgotten and arithmetic is remembered as an unpleasant nightmare, but the love of Nature aroused in that schoolroom under the guidance of a teacher who was herself a lover of the fields and woods, has given more pleasure than all else in life combined. I would dedicate this article to that teacher.

"*The study of nature is an intercourse with the highest mind. You should never trifle with Nature. At the lowest her works are the works of the highest powers, the highest something in whatever way we may look at it.*"—AGASSIZ.

"Special Topic in Botany"

DOROTHY HORN

A PLANTING PROJECT AS A PART OF BOTANY.

The outlook and experience, step by step, of the pupil who is carrying on any out-of-door project in connection with school work are interesting and have special value for teachers who are superintending and planning this sort of work. The following experiences of Miss Dorothy Horn and Miss Nellie Jones are especially interesting in that they used as their chief authority the very beautiful and important bulletin on Landscape Gardening by Dr. Wilhelm H. Miller, published by the University of Illinois.—EDITORS.

In the High School at Springfield, Illinois, each student in Botany is expected to select one or more special topics for work outside of class. The topic which I selected was "The Planting of the Stuart School Lawn." The reason for my selecting this topic was because I was interested in making the appearance of the lawn more beautiful, first because I am a graduate of that school and second because I live in the adjoining vicinity.

The school's location made the School Board interested in beautifying its lawn. It is located in one of the oldest neighborhoods and adjoining one of the most beautiful boulevards in the city. The President of the School Board asked our class in Botany to have a plan drawn and have it submitted to the Principal of the Stuart School, for adoption.

The first point which I did in working out this topic was to go at once and have a talk with the Principal. This enabled me to see what idea she had on the subject.

The next was to draw a plan remembering several facts I had studied when the class took up the subject of landscape gardening also referring to a book which I found would help me.

Then I found what was best to plant in certain places and where it was best to place beds. This I obtained mostly from *The Illinois Way*, a magazine edited by The Agricultural Department of the University of Illinois.

The Mothers' Club had planted some shrubbery such as barberry, Japan quince, viburnum, spirea van Houtteii and yellow currant in front of the school building a few years ago, so I decided to make the planting thicker by planting such shrubbery as barberry, sumach, ninebark, for a foundation, and using coxcombs and dahlias as a touch of color for the fall, then tulips for the Spring color. Then I made four other beds which I placed on each side of four walks leading from the four corners of the lawn.

Then I planned an old-fashioned garden in the back of the school.

The next puzzling thing which confronted me was "What shall I have them plant?" This was solved by reading a few books on the subject. Such books as "Bergen's Essentials of Botany," "Shrubs for all Climates," "Our Northern Shrubs and How to Identify Them—Keeler," "Landscape Gardening in America," and "Protective Decorations."

This completed the plans. They were presented at a meeting of the Mothers' Club by our teacher where they were accepted.

Then the Club appointed a committee consisting of three ladies living a short distance from the school to put this plan in effect. The first movement they made was to get bulbs to be planted, the money being obtained by placing a box in each room of the school where the children were to save their pennies. The tulips were then bought and planted in a large bed on the north side. The Committee wished to plant shrubbery but at that time were rather financially embarrassed.

A real estate man heard of their plan and also the lack of funds, so kindly donated some shrubbery from Oak Knolls and also spent one afternoon on which he superintended the transplanting.

The Park Board also decided to donate some of the surplus shrubbery from some of the Parks so the yard is quite changed.

During the hours of recreation the children, under the supervision of their teachers, work carefully in caring for it. They are all proud to say they are helping to beautify their lawn.

If this school continues in beautifying its lawn it will place them first in the beautiful lawns along the city schools. We hope they will succeed in doing this which will make the patrons proud to say they are associated with that school.

SHADY NOOKS

NELLIE JONES

Since I was to help in arranging the plantings on the Stuart School ground, I chose the shady places. First I measured my plot of ground in order to know how many plants to put in. Then I had to decide what to plant so as to give the best possible effect. I obtained my idea for the arrangement of my plot from a book called, "The Illinois Way," which we had been using in school for

Landscape Gardening. One of the plots was on the northwest corner of the building and the other on the northeast corner. On this last corner I thought it best to plant sumach, viburnum, deutzia, and dogwood, because they grow in shady places and make a very effective background. I had to be careful not to plant the sumach in front of the windows because of its height, so I planted the viburnum in these places, allowing five feet for each plant. Around the edge I planted ferns and lilies of the valley to fill in the empty spots.

The northwest corner also required plants that would grow in shady places. Here I chose ninebark, weigelia, Dorothy Perkins roses, Japan Quince, and Four o'clocks. I did this to have one side in pink. The four o'clocks bloom early.

After these plans were finished they were submitted to the Patrons' Club and accepted. The work has already begun. The children are helping pay for some of the shrubbery and the Park Board for others. They are working hard and hope to make a great success.

William H. Eyster, of the Pennsylvania department of forestry, is to be head of the science department and supervisor of nature study at Cortland Normal, 1916–17.

Mrs. Anna Botsford Comstock addressed the teachers of the City of Washington at Teachers' Institute of the District of Columbia, Sept. 27th–29th.

Indian Why Stories, Frank B. Linderman, illustrations by Charles M. Russell. pp. XVI + 236. Charles Scribner's Sons. $2.00.

Any people in as intimate contact as were the North American Indians with Nature are bound to have a folk lore full of nature mythology. The Indian's explanations of the familiar things about him are full of strange fancies. Herein they are related and many a winter evening will be beguiled for old and young alike with these tales. "Why the Chipmunk's Back is Striped," "Why the Kingfisher Always Wears a War-Bonnet," "Why the Birch Tree Wears the Slashes in Its Bark," are sample titles. The book is a literary production of merit with a smack of Kipling's facile expression and the illustrations add much to its attractiveness.

Some Habits of the Carp

Roy Walter James

(A sample of Real Nature-Study.—The Editor.)

About one mile south of the town of Puente, Cal., is a small creek that contains water all the year around. The stream is known locally as Puente Creek. Downstream about three miles and near North Whittier Heights, where the Salt Lake Railroad crosses the creek, a cement dam has been built beneath the bridge, forming a pond that extends back upstream about three-quarters of a mile. In this pond and also above and below it cat-fish, carp, and many other fresh-water fishes abound. At the pond above the dam I have spent some time studying them.

I am limiting this writing to the results of my study of the carp. As far as I have been able to determine they are the German carp; but they have extremely large eyes which is not usual with the common species of German carp. I have loitered around the places they haunt at all times, from midnight to dawn, and thru all hours of the day, so that I could observe where they are and what they do during these different times.

From 9:00 P. M. to 2:00 A. M. they seem to rest absolutely, along the bottom of the stream; then about 4:00 A. M. a few of them will feed a little, while as yet most of them still rest. As soon as it becomes light they begin swimming around but they do not feed At this time they stay in the deepest shades, under roots, overhanging trees and logs, and in holes in the bank. From 9:00 A. M. to 1:00 P. M. they are very lively. This is the best time to observe them.

It seems as if a fish or group of fishes has a certain beat to patrol. When any foreign creature comes along it is chased away. For example: I once put in the pond a small catfish that I had caught in the stream and the carp came in great numbers and chased it off downstream. There was in particular one large fish with a yellow fin that could always be found within a space of one hundred feet along the stream, on one side or the other, between or under two willow trees that overhung the water. Sometimes he could be found at one end of his beat and sometimes at the other, but never above or below these trees; which goes to show that they have certain patrolled areas that they do not leave.

Some fish like to be alone (especially the large ones) and some go in groups. When in groups they go along in a line, single file. They patrol back and forth for a distance of one hundred or more feet; first on one side of the stream and then on the other. They seem to make the rounds at quite regular intervals, about every forty-five minutes. It is always easy to tell when they are going to come along, if you are lying along the bank with head down close to the water because the little minnows which are always about go in front of the large fish. These minnows come along in great numbers for a minute or so, then they all disappear upstream or hide along the bank; then in about four minutes, looking down stream about forty feet away you see the string of large fish coming along. They come in a line containing from nine to sixteen fishes. They do not feed much but just seem to be patrolling. I have fed them but they do not care for food until afternoon, tho one fish now and then will leave his place in the line and take a piece of dough which I have thrown in. The small minnows and turtles usually eat it up because the carp will not touch it.

About noon they become quiet again and swim lazily in the shade of willows and of the banks. But at one o'clock they become very lively and hungry. From one to five they are extremely busy getting food. Some of the reasons why they like to feed most then are: the wind comes up then and in doing so it ripples the surface of the water making the fish hard to see; it sways the trees more or less and blows worms and insects off the leaves of the trees into the water below, and when the wind is so blowing many insects, gnats, flies, etc., flying above the surface of the water are blown down into it.

During this part of the afternoon one can hear many peculiar noises along the stream under the overhanging trees and weeds and along the bank among the cat-tails. When sitting there or even walking by, one hears many popping sounds that go "smack." They puzzled me for some time. At first I thought this "pop" was made by mud-hens, but I found out it was produced by the feeding carp. I was quite close to the water one day beneath the shade of a willow and the water was covered almost entirely with willow leaves. I had been hearing those smacks up- and downstream and was then watching between the willow leaves floating on the water, several large carp. One big fish came up toward the surface and put his mouth on the under side of a willow leaf and sucked it in;

a low "pop" was heard as the ripples spread and the fish was gone below again. They get much of their food by sucking the insects from the underside of willow leaves, and logs that float on the water, each time making a pop more or less loud. Likewise they suck the stalks of reeds, cat-tails, and other water plants.

At many places along the banks the willow roots grow out in the water and form a large mass of fibers sometimes three feet thick. The carp surely enjoy nosing up in these for food. Many times they reach the surface of the water and stick their mouths out and open and shut them as if gulping air. I have seen as many as six mouths protruding above the surface out of a bunch of rootlets at one time. The fish were entirely hidden except for their mouths—they could not even see me.

In the late afternoon, from four to five-thirty when the sun's rays are quite oblique, they all seem to like to get out in the middle of the stream and take a sunbath as it were. They all look toward the sun with their heads close to the surface and now and then suck in an insect that the wind is blowing along the top of the ripples. I have counted by two's, twenty-eight of them below me at one time out in the open stream; and none of them were less than fifteen inches long. Of course if a strange man or dog passed by they immediately disappear into the deep shades below and stay there for some fifteen minutes, then they gradually take their places again as before. When the sun gets quite low they go back to the shades again among the cat-tails, and under over-hanging weeds and trees that touch the water.

I have found that the thing carp like best to eat is a stiff dough made of flour and honey. They eat balls of this better than anything else. I have tried everything from pieces of chicken and beef, to bread and cake,—they like cake but like the honey and flour mixture best of all. I think the dough balls of honey and flour are the best bait to catch them with.

Since learning their habits I have never used bait. I just tie the line to a sapling, crawl down the bank to the water with the hook in my hand, and wait for some fish to stick its mouth out of the bunches of willow roots; then I jab the hook quickly into the mouth of the first fish that appears, before he knows what has happened; then I crawl up the bank and pull him in. Of course when I first tried it I would miss the mouth of the fish and hit the side of it, then he would get away in a hurry; but I became skilled

so that I could catch them that way much more readily than with bait. I hold that this way of fishing is much more exciting than any other. You cannot blame little fish and turtles for stealing your bait as an excuse for not catching any fish; and if you do not get a fish it is your fault entirely, and if you do it is a great and new sensation to feel that you have actually put the hook in his mouth with your own hands.

Of course a person new in the business might not even be able to see the fish stick his mouth out of water, to say nothing of jabbing the hook into the mouth of the fish. They are very shy until they get used to you, and that takes several days. I always start in feeding them for three days, not trying to catch them at all, just getting acquainted with them.

Some things carp eat besides those mentioned heretofore are: small fish in great numbers, large tadpoles, water-spiders, soft roots of grasses and plants, dragonflies, mosquitoes, fish eggs, fish of their own size, when these die by accident or disease, and many miscellaneous things that are always finding their way into streams, as small birds, rabbits, squirrels, and lizards.

The more we learn—the more we want to learn. When we find a few interesting facts about the carp we want to learn more; and there is always more to learn,—so let us on.

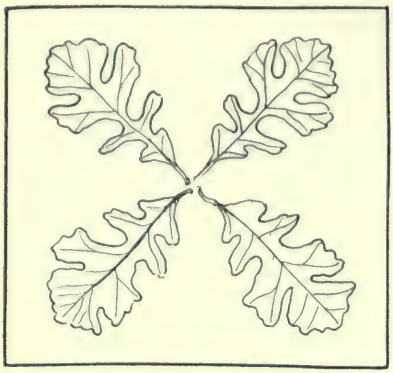
The Origin of the Earth. Thos. C. Chamberlin, pp. XII + 272. The University of Chicago Press. $1.50.

This is a masterly presentation of a great theory put so clearly that the layman may read it with delight. The old nebula hypothesis of LaPlace and similar theories of the origin of the earth having proven inadequate, Professor Chamberlin and others have worked out a new theory of origin which is here presented.

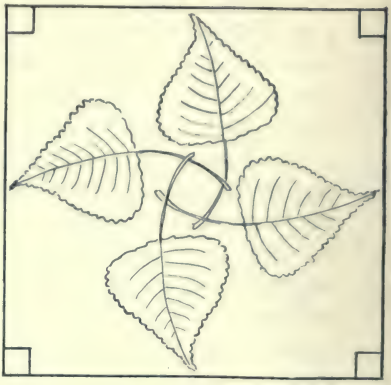
The first three chapters deal with the crucial defects of the older theories. Chapters four and five trace the groping forward into the new point of view which is stated in chapters VI and VII. This is the planetessional hypothesis and is briefly that the original earth was a large fragment in the midst of multitudes of fragments that pulled away from a nebulous mass, the residue of which is the sun. The earth grew in size as the large mass accumulated the smaller ones by gravitation. Chapters VIII and IX deal with the juvenile shaping of the earth and its reorganization. Chapter X discusses the emergence of the living from the non living.

Topics for October Nature-Study

ANNA BOTSFORD COMSTOCK



THE MOSSY-CUP OAK



THE CAROLINA POPLAR

The child becomes acquainted with the trees by mounting or tracing their leaves on cards in formal designs.

SECOND GRADE

In October in the East we all study foliage. It is the month when the beautiful colors of the leaves paint the landscape so that all who look may become artists involuntarily. Therefore, it is just the time for the little ones to give closer attention to a few beautiful leaves. Perhaps they have already in kindergarten and first grade studied in mount or outline a maple leaf or an oak leaf. Now they should be encouraged to bring in as many brilliant colored leaves as they can find.

Cocoons—Many insects have to solve a very grave problem during their growth and that is how to protect themselves from weather and animals during the pupa stage, which is a stage in its development where the insect is quiescent and helpless. It no longer has a mouth for eating or legs for escaping, nor has it yet wings for flying. It is simply a little helpless live mummy in which wonderful changes are taking place, such as the growth of wings and the change of form. The butterfly caterpillar does nothing to protect itself at this crisis except to select some protected spot and suspend itself with silk where it will not be readily seen; but the caterpillar of a moth spins a protecting blanket of silk within which it changes to a pupa. These blankets are called cocoons, and they are skillfully woven of silk which comes from an

opening in the lower lip of the caterpillar. It seems strange that a caterpillar that has never needed a blanket should be wise enough to spin and weave one to protect itself, when it is no longer a caterpillar and helpless.

The pupils should be encouraged to bring in all the kinds of cocoons possible. If the school is in the city, cocoons may be obtained at dealers for a small price. For the care of cocoons see method, *p.* 334; for the Promethea, use *obs.* 1 to 6, *p.* 339; for the study of the Cecropia cocoon, use *obs.* 1, 2, 3, 3, *p.* 334; *for the cocoon of the woolly bear, *p.* 329.

A CRICKET CAGE

The black cricket—Early in October these sable little fiddlers are much in evidence, and will live very happily if kept in the school room in a cricket cage, and fed on melon rind or sweet apple or peach. The father cricket is a musician but he will not play his mandolin unless he is sure of an audience, so it is well to put two or three mother crickets in the cage with him. The mother cricket is easily distinguished by the long sword-like ovipositor at the end of her body. The cricket cage may be moved from desk to desk for observation. A few questions may be asked at a time covering the subject matter on *p.* 373–375. Use *obs.* on *p.* 376, dividing the study into about three lessons. In connection with this sing the Cricket Song:

He's a gay little fiddler bowing low,
Chirp, chirp, chirp, chirp, chirp!
One wing is his fiddle, and the other is his bow,
Chirp, chirp, chirp, chirp, chirp!
Sometimes he plays both day and night,
Chirp, chirp, chirp, chirp, chirp!
But his music's always gay and bright,
Chirp, chirp, chirp, chirp, chirp!

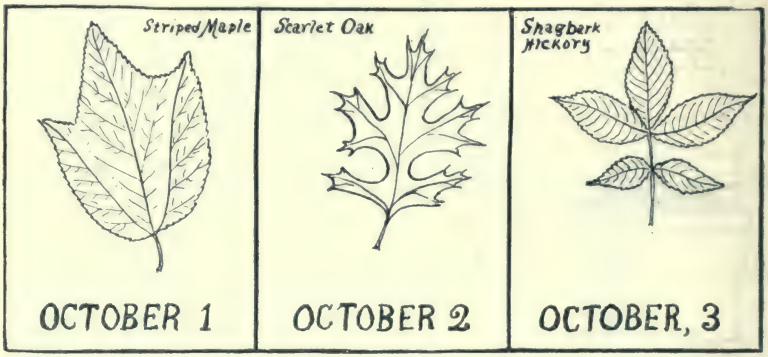
—From *Nature Songs and Stories by Katherine Creighton.*

The peach—In studying a fruit of any sort we must always especially note the seed which after planted will reproduce the plant. In wild fruits the edible pulp connected with the seed is for the purpose of enticing birds and animals to eat, and thus incidentally to scatter the seed. But in the case of fruits used by man, a large amount of pulp has been developed for his delectation. This is true of the peach.

*Where the name of the book is omitted the reference is to The Handbook of Nature-Study—Comstock.

The questions to ask about the peach are in brief:—How is it protected outside? What part of the peach do we eat? What part do we throw away, and why? Is the shell of the peach pit hard? Where does it come apart to allow the seedling to sprout? Examine the seed within the peach pit. How is it covered? Note the little point at one end which will produce the young plant. It would be well to plant a peach pit in some protected place so that the seedling may be studied next year.

THIRD GRADE



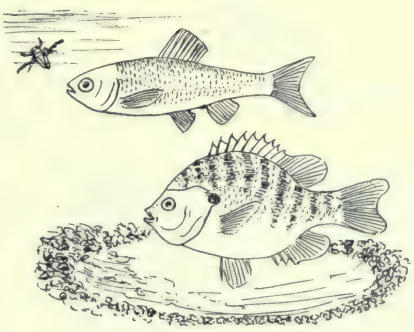
The pupils should make a leaf-calendar for October.

Autumn leaves'—This study should give something new for each day in October. There are various ways in which the forms of the different kinds of leaves may be fixed in the pupils' minds together with their names. Each leaf may be pressed and mounted and labeled, or the leaf may be traced in pencil and colored with crayon and labeled. But perhaps the very best way to keep up an interest in this work for the entire month is to make an October calendar, selecting a leaf of a different species of tree for each day. The leaf should be labeled by the child who mounts it upon the card. But perhaps the teacher should write in the date and after each add an appropriate verse or quotation. Of course the cards for the calendar should be of uniform size.

Teaching the names of the trees should never be done as a task but rather incidentally or as a game. The following plan I found most successful with small children. We had traced many leaves. The drawings were in a pile, and I asked Dorothy to find red oak,

and John to find a sycamore leaf. It was only a short time before they knew the names of all the leaves we had studied.

The sunfish and the shiner—Any boy in the vicinity of a pond or dam can furnish a pumpkin seed for this lesson. He can also furnish shiners or some other of the minnows. These fish should, unless of nearly the same size, be kept in separate aquaria. Now is the time to make a balanced aquarium for there is plenty of pond weed to be found in still pools. Go to the nearest pond with a pail in which you can place the water plants as you dip them up with the dip net. To make the aquarium, use a battery jar or any other kind that is large enough. Place a little gravel in the bottom of the jar; tie to the root of each plant a pebble for an anchor, and plant it in the gravel; then add the water carefully so as not to disturb the planting, and you will have an aquarium where a fish will live indefinitely, without change of water. Lesson LXXXIV, p. 380. If it is not possible to get the plants for a balanced aquarium, the sunfish can be kept in a jar by changing the water every other day. These fishes may be fed on small earth worms. Sunfish have exquisite colors and most interesting habits. For these lessons, use questions in *obs.* 2, 3, 4, 5, *p.* 175. For identifying and naming the fins, use diagram *p.* 150. *Obs.* 7, *p.* 176 should be used as an outline for a story which may be found on *p.* 174.

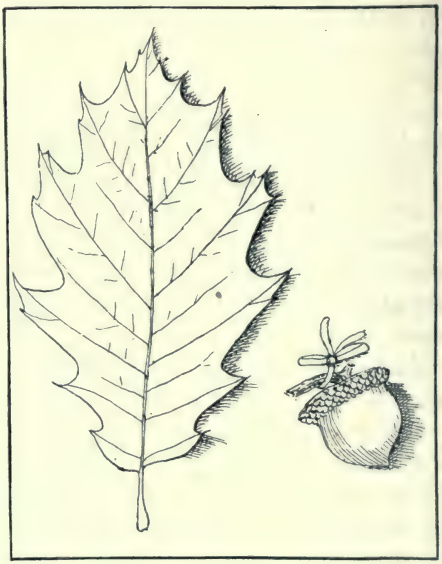


SHINER
SUNFISH GUARDING HIS NEST

The study of the shiner or minnow should hinge on its difference in form from the sunfish. Especial attention should be called to the use of the fins when the fish is swimming. Use *obs.* 2–9, *p.* 163 for this lesson. The shiner, dace, and minnows most generally live in flowing water so that they do not live long in an aquarium unless it is furnished with running water or contains water plants.

FOURTH GRADE

The chipmunk—This fascinating little creature may be studied to great advantage in October, when he is still active and busy carrying stores to his cellar so that when he chances to awaken from his long hibernating nap in the winter, he will find refreshment close at hand. The best way to give this lesson is to get the children to observe the chipmunk in its native haunts. Of course this is possible only when the school is within the reach of woods or it may be observed in a zoölogical garden. The thought to bring out in the lessons is that the chipmunk is a ground squirrel, although it can climb trees, and that it has cheek-pouches in which it carries its food. *Questions* and *obs.* 1–4, *p.* 241 will give the pupils an outline for their field observations. The story of the chipmunk in Squirrels and Other Furbearers by John Burroughs should be read to the class, and the points covered by *obs.* 5, 6, 7, *p.* 242 may form an English lesson, derived from this story.



RED OAK LEAF AND ACORN MOUNTED ON A CARD.

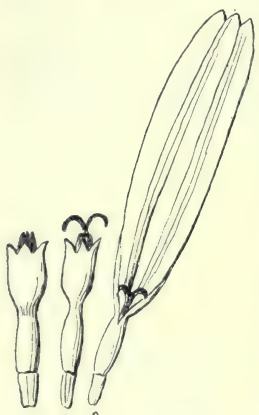
Leaves and fruit—The study of leaf forms in the first three grades will have made the children somewhat familiar with the names of the trees, and it is now time to add another subject of interest,—the fruit. The leaf should be pressed and mounted on a card and, on the same card, the fruit should be fastened. This may be glued in the case of the maples, ashes, etc., or may be fastened by sewing fast with strong thread. Even acorns, chestnuts, and hickory nuts may be thus made fast.

The children of the fourth grade should be able to understand what a composite leaf is. In the case of the scarlet oak, or the

silver maple the lobes are cut very deeply. In the case of the compound leaf this cut is still farther. It is cut away until nothing but the midrib is left, and now we call the lobes leaflets which means *little leaves*. The leaves of hickories, walnuts, butternuts, locusts, ash, ailanthus, sumac, horsechestnut, and buckeye all have compound leaves. For the study of the compound leaf, use *obs.* 2, *p.* 777.

AN INNER AND A BORDER FLORET AND A BRACT OF QUEEN ANNE'S LACE, ENLARGED.

Queen Anne's Lace or Wild Carrot—This encroaching weed has most interesting habits. In early October its beautiful blossoms are still to be found, though not so large and elaborate as those which occur in August. But even in October the blossom clusters show the dark red blossoms at their centers. Each flower head is made up of tiny clusters of flowers and what is especially interesting is to note that the flowers on the outside of the big cluster or umbel, as it is called, have larger petals than those on the inside, thus making a lacy medallion of beautiful pattern. Another thing to note is the way the little flower clusters turn toward the center as they fade, and how the lacy thread-like bracts lift up around the ripening seeds. The study of this weed may be divided into three lessons: For the first, use *obs.* 1, 2, 3, 4, *p.* 592–3; for the second use *obs.* 5, 6, 7, 8, *p.* 593. The third lesson should be a study of the plant in the field to note how it takes possession of the ground, and how its foliage and seeds are untouched by animals and birds. See *p.* 591.



1 2 3

DAISY FLORETS

1. Disk-flower in pollen stage;
2. Disk-flower in stigma stage;
3. Ray-flower. All enlarged.

The white daisy—This sturdy flower of the field continues to bloom through October. It is a composite and is similar to the sunflower, except that the banners it waves to attract insects are white instead of yellow, *p.* 560. For the lesson on the daisy, use Lesson CXXXV, *p.* 554. It may not be possible for the pupils to see everything brought out in this

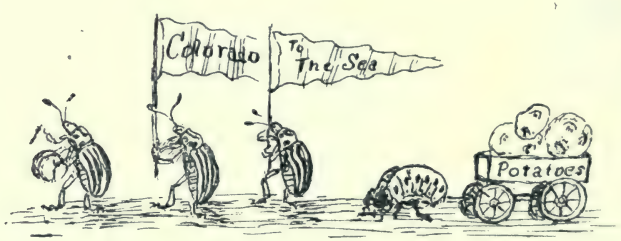
lesson, because the disc florets are small and probably at this season have finished blooming. Omit *obs.* 3, *p.* 555.

LADYBIRD

PUPA LARVA

The ladybird—At this time of the year the ladybird beetles are crawling about to find cozy places in which to pass the winter. These kind little friends who help us so much in the garden deserve careful study. For a lesson on the ladybird, use *obs.* 1, 2, 3, 4, 5, *p.* 415. The story of the larvæ should be told (*p.* 414) in such a way, and pictures should be shown (*p.* 415) that the pupils' interest will be stimulated in this useful insect. Supplementary reading: Ladybird, Ladybird, Fly Away Home, in "Dame Bug and Her Babies," Edith Patch.

The Colorado potato beetle—This may be found in any potato patch in October by digging in the ground around the potato hills or in looking under rubbish around the fields. Often indeed a few chance planted potato vines are still green and the orange larvæ may be found industriously feeding. This insect may be studied as a beetle type. For a lesson on the beetle, use *obs.* 2–5, *p.* 411–12. Its method of self protection may be told in a story, *p.* 49, and studies by using *obs.* 6, *p.* 412. The story of the marvelous march of beetle hordes from Colorado eastward to the sea, should be given as an exercise in English.



THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

Published monthly, except June, July and August. Subscription price, including membership in the American Nature Study Society, $1.00 per year (nine issues). Canadian postage, 10 cents extra; foreign postage, 25 cents extra.

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Editorial

In the last editorial attention was called to the recent commendations by eminent educators of science instruction in the elementary schools. The school surveys that are so conspicuous a feature of recent educational activities are resulting in recommendations to the same effect.

The Portland School Survey Report states (p. 111) that "A practical concrete course in nature-study, based not on books, but on the phenomena of nature themselves, ought to form a part of every elementary school curriculum, from the lowest to the highest grade."

The Cleveland Survey volume on What the Schools Teach and Might Teach says "No elaborate argument should be required to convince the authorities in charge of the school system of a modern city like Cleveland that in this ultra-scientific age the children who do not go beyond the elementary school—and they constitute a majority—need to possess a working knowledge of the rudiments of science if they are to make their lives effective. . . Considered from the practical standpoint of actual human needs, the present almost complete neglect of elementary science is indefensible."

There never has been a time when the average home was as much interested in the phenomena of nature as at present. People of the professional class are coming to look upon a speaking acquaintance with birds, and trees, and flowers and butterflies as essential to intelligence, quite as essential as familiarity with army movements in the war or the point of view of a conspicuous author. A new well written nature book sells like a popular novel. The den of the middle-class boy or girl has nature books on its book-shelf

along with the favorite stories or biographies quite as a matter of course.

The opportunity for effective nature-study in the schools has arrived. Nothing can divert the new insistent popular and educational demand from a worth while course of study in elementary science in the grades but the stupidity of those to whom falls the task of its formulation and execution.

Dr. Edward F. Bigelow, Sound Beach, has been elected "Scout Naturalist" of The Boy Scouts of America and will conduct a department "On Nature's Trail" in *Boy's Life*.

The Life of Inland Waters. Jas. G. Needham and J. T. Lloyd. 438 pages. The Comstock Publishing Co. $3.00.

The subtitle of this book is "An elementary text book of fresh water biology for American students." It is biology from the new point of view, the ecological, and it deals with animals and plants in relation to their environment. The nature of the aquatic environment is discussed with reference to its transparency, density, chemical content, etc., at different times of day and year. Then the types of aquatic environment are taken up, lakes and ponds of various sorts, streams, marshes, swamps, bogs. Chapters IV and V nearly two hundred pages are devoted to aquatic organisms both plant and animal with most space given to the animals. The more commonly occurring forms are described and their life relations are discussed. Chapter VI is given over to aquatic societies, both plant and animal, and the last chapter is on the culture of fresh water forms. There is a well chosen bibliography.

The book is to be highly commended for the unified view it gives of the water environment. There have been excellent animal ecologies and plant ecologies but the student usually wants to study a stream or pond and desires to know not the plants only or the animals but the biological relations including both plants and animals. That he gets here in one excellent book.

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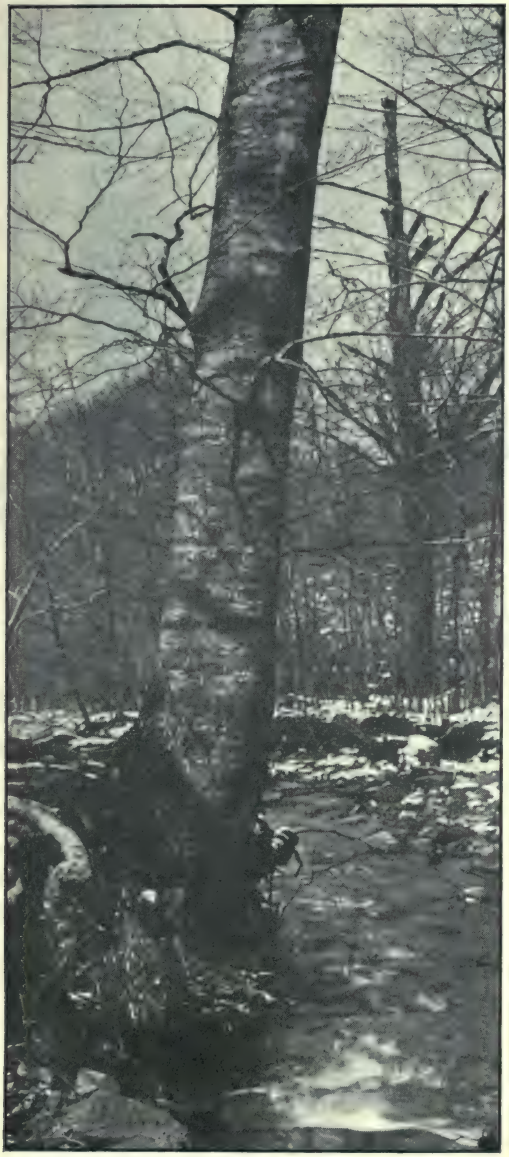


Beech

BY L. H. BAILEY

Granite-stocked bole in the forewoods
Staid in the storms alarms
Floor of brown leaves in the coppice
Stretch of the outward arms
Calm in the moods of November
Bright in the sun-short day
Publican tree of the forest
Smooth-barked quiet and gray,—
Reach me your burrs of deep Autumn
Nut-kernels three-cornered and brown
That slip one and one from your couplets
Tap tap on the under leaves down,
Reach me outreach me your dead leaves of September
Blossoms of spring-time and burgeons of June
And rustle the months that hang on your branches
That shed from your branches their winter-old rune.

Beech tree! The year is at its ember
The flush days disappear,
Yet all the weeks that I remember
Of every budding dying year
From November till November
Ye have girt the greenwood here.

Western Flower Beetle on Shasta Daisy
Photo by E. V. Essig, Univ. of Chicago

Ways of the Western Flower Beetle

By R. A. Sell

It is impossible to study any living thing for several months at a time without developing some sympathy for it. This was found to be true even of a destructive insect. In studying the Western Flower Beetle (*Diabrotica soror*) at Berkeley, California, we found it to possess so many admirable traits and interesting adaptations that we were truly sorry that its interests were opposed to ours and that it was necessary to plan its destruction.

This beetle is sometimes described as a "slim green lady bird" with black spots on its wings. But the "lady bird" is a predacious insect that renders an important service to man by destroying harmful insects, while the flower beetle is a plant-eater that is especially fond of all kinds of truck crops and ruthlessly destroys Shasta daisies and California poppies.

One of these beetles is about as large as a "lady bird" but its body is much more slender and its legs are longer, besides it has

long slender sensitive antennæ. In working out their field habits we marked the beetles by painting a dash of red India ink, usually on the wing covers. By marking it in a peculiar manner it was possible to recognize a certain beetle wherever found.

These insects seem to have something of a "homing instinct" for they will return to a particular plant for several successive nights. When carried a mile away, at night, one beetle returned three different nights, but for some reason, it got lost on the fourth and was never found. Because a particular male beetle was found on a certain canna every day for twenty days he was nick-named "jerry-on-the-job." Two females called "the twins" that were found safely domiciled on another canna were on hand every day for eleven days.

The expertness of the flower beetle in making its escape from a plant is remarkable. Frequently one will drop to the ground when the plant is disturbed but its tactics are always problematic. It may simply dodge to the other side of the stalk like a squirrel or instantly take wing just as you are looking for it to fall to the ground. Again how expertly it catches on a branch just long enough to give it a swing to another branch farther around the plant so that after two or three such maneuvers it lands safely at the opposite side of the plant. Where plants are close together it may simply swing by a series of acrobatic "stunts" from the upper branch of one to the lower branch of another. Then it will begin rising by a series of jumps, walking out on a lower branch and jumping to a low hanging leaf of the next higher; that branch gained, it jumps to the next above and so on until it has reached a satisfactory place. Sometimes it will only partially spread its wings and sail from a higher to a lower branch that is some distance away,—flying-squirrel fashion.

The beetles are very sensitive to light and if the light is very strong they become nervous. When one beetle is confined in a glass case it will learn to permit the food to be thrust through the opening without attempting to escape. By a series of experiments it was found that they were sensitive to certain musical sounds. One male that would usually elevate his body and raise his wing-covers when a certain high pitched note was sounded on the autoharp was styled "the musician." They pay no attention to the lower tones but when the higher tones are produced they usually show some reaction, although it may be only a sort of nervousness.

The eggs are lemon-yellow and quite small—necessarily small for a female beetle lays from forty-five to sixty-five eggs in a day. In her laying season, which covers about six weeks, she lays from two hundred to three hundred eggs. These are deposited in clusters of five or six, set on end and fastened to the plant with a sticky substance. Under a strong magnifying glass one of these tiny eggs has a well defined color-pattern. The first sign of hatching is a tiny dark spot near the end that is attached to the plant. As this spot increases the egg has a tendency to swell in the middle and by pressing against the other eggs will become indented. Finally the larva seems to change position within the egg for it gnaws its way through the outer end of the egg. When the minute, white larva emerges it crawls around the top of the shell a few times and then leisurely begins a search for food.

Book Review

The Holy Earth. L. H. Bailey. P. 171.. Scribner's. $1.00.

The thesis with which Professor Bailey starts this delightful series of essays is that the earth is good, it is kindly, it is holy. The bulk of the book is taken up with the consequence of these attributes. Some selections taken at various points in the book will give the reader some notion of the content, sufficient, it is hoped, to insure his perusal of the entire volume.

"Man has dominion but he has no commission to devastate."

"No vanishment of the earth or monopolistic control of its bounties, will build a stable society." "If we may fraternize territory, so shall we fraternize commerce. No people may rightly be denied the privilege to trade with all other peoples."

"This means a new division and perhaps a redistribution of lands in such a way that the farmer will have his due proposition of hill and of valley, rather than that one shall have all valley and another all hard-scrabble on the hill or all waste land in some remote place. . . . It means that some roads will be abandoned, entirely, as not worth the cost, and society will make a way for farmers living on impossible farms to move to other lands; and that there will be no 'back roads,' for they will mark an undeveloped society. It means that we shall cease the pretense to bring all lands into farming, whether they are useful for farming or not; and that in the back country beyond the last farms there shall be trails that lead far away."

A Marvelous Background

By Editha Campbell, Erie, Pa.

An artist in composing his picture gives as much attention to the background as to the figures that are to stand out from it. It must give the "depth" his picture needs. So in our love for nature we study the birds, flowers and insects and their uses to man, forgetting they are, after all, but the figures upon the marvelous background of our earth's life history. A background giving depths of millions of years to the exquisite designs painted upon it.

A friend of mine once said "Palaeontology can't be made interesting to children, it is too dead." I thought otherwise judging from the interest one little girl I knew, displayed in hammering the rocks to find a whole trilobite and hunting the different fossil corals,—and the pride she took in the fact that "her summer cottage was on a glacial moraine." The result was, a little class in a private school was formed of children from eight to eleven and tried on the subject, then the entire number of fifty-five children ranging from nine to fourteen in a rural school, making two distinct types of children.

First we had a few mythological stories of some of the stars with their distances from us. Then the relation of our sun, moon and earth to each other together with the story of our earth when a star, its gradual cooling, its formation of an envelope of atmosphere, and how at last through chemical action the particles from the cooling mass were formed that at last raised to view our first glimpse of land over in the Laurentian Hills. Next came lantern slides first showing the scenery of the cooled off moon. And when the children realized the "Man-in-the-Moon" was made up of wonderful burned out volcanoes with craters miles in diameter, and vast lava seas, their "Ohs!" came from all parts of the room. Our earth we had learned had cooled and is still cooling, but how do we know? The slides took us through the "Yellowstone Park and Old Faithful, the Beehive and the hissing down in the Devil's Kitchen and all the marvels of that Park that makes any thinking person who goes through feel the Unseen power that has brought all this to pass, told us plainly our earth had not cooled entirely.

A part of our background was painted but not all. While our earth was cooling, away back in the dim dawning of its history,

our little strip of land was growing, and most wonderful of all life had begun. So now came stories beginning with life's simplest form, protoplasm, and a papier-maché model of the amoeba gave us the "big" idea of it, while a glimpse through the microscope at the living form made us appreciate the wonder of the infinite little. The undecided Eozoön, the Foraminifera, with its calcarious secretions giving us our first shelled animals, followed. Our next stories traced our slate sponges and coral beads back to their ancestors that followed the Foraminifera and Bryazons, all illustrated with fossil specimens.

Were the children interested in Paleontology? My friend would have been answered by the absolute quiet of the room, and the eagerness for the next week's story.

Following the corals and sponges came slides of the grotesque life, of the seas, land and air. These stories were in series and as we passed from age to age the children were quick to see the new forms of life, tracing the evolution of many, and the resemblance of others as the ancestors of many of our living forms. As the hour hand on our geological clock gradually drew nearer, familiar forms appeared. Our ancient cock roach was evolving and we heard our first "fiddler." On down the ages we came and at last got our first glimpse of two of the most beautiful things created, the butterflies and moths with their wings reminding us of "pages from an old illuminated missile" as Wallace so beautifully puts it. The Archaeopteryx was evolving to our lovely birds. The horse, and dog and many of our familiar friends were now perfect pictures. The background so marvellous, so awe-inspiring, so almost overpowering was now partially painted in, and we were ready for our foreground. Now comes the economical value of our birds as well as their asthetic value; the gathering of cocoons that we may see the butterfly and moth emerge, teaching us lessons we will never forget, but always know with their relation to man.

This winter we go back again into the dim past. Our world is beautiful in its animal life, but equally beautiful is the plant life, so back to the simplest forms we are going, tracing back the ancestors of our familiar flowers, and will lose ourselves in their wonderful life histories, and through the slides and the microscope again see the wonders of the infinite little and bow our heads to the "Infinite works of Infinite Wisdom."

"Flip," the Steller's Sea-Lion Diving

A Steller's Sea-Lion That Dives

By Gayne T. K. Norton

An aquarium or zoölogical park that has not a sea-lion tank is without one of the most popular and instructive exhibits an institution of this kind can have.

Sea-lions are always interesting and it is seldom that a laughing crowd does not surround their enclosure. Happily these animals are plentiful and if they do no more than give us a good laugh, the time we spend watching them is not wasted.

The collection of five "lions" owned by the New York Zoölogical Society in the Bronx Zoölogical Park, New York City is a fine one, and one that is not duplicated the world over. Four of these animals are of the California variety while the fifth is a Steller's sea-lion.

"Flip," the Steller's sea-lion so-called by his keeper because of the largeness of his flippers, is an animal highly prized by the Society. "Lions" of this type rarely live in captivity, and have never been known to dive. They inhabit the shores of the northern Pacific from Behring strait to California and Japan. California lions do well in captivity and all dive. "Flip" has proven the rule by being the exception. He is not only "waxing fat" and growing in his confinement, but has become tame, learned many tricks, and developed the art of high diving to a marked degree.

News and Notes

Dr. R. W. Shufeldt, 3356 Eighteenth St., Washington, D. C., has recently been selected as editor of the "Department of Wild Flowers" of the *American Forestry Magazine* of Washington, D. C. His duties will begin with the November number; and not only will Popular Botany be dealt with on the broadest possible lines, including wild flower conservation, botanical clubs for children, teachers, and others, but insects and birds will occasionally be touched upon as occasion demands. Good letters and flower photographs from correspondents will be published, flowers identified, etc.

The Council of A. A. A. S. Association at its meeting in Columbus last December, voted to admit to membership in the A. A. A. S. *during the calendar year 1916 only*, without the payment of the usual $5 admission fee, such members of the various affiliated societies as may wish to join with us.

This means that any subscriber to THE NATURE-STUDY REVIEW may become a member of the American Association for the Advancement of Science, by paying the membership fee of $3.00 to L. O. Howard, Washington, D. C. This entitles to a year subscription to *Science* or to *Popular Science*.

One of the Common Dragon-flies (*Libellula pulchella*). Note the male Katydid on top; the plant is the trumpet-vine in late summer.

Nature-Study and the Common Forms of Animal Life

Dr. R. W. Shufeldt

If there were one article that appealed to me more than another in the Nature-Study Review (April, 1916, p. 148), it was the most interesting contribution by Mr. Hendricks on "The Home Museum as an Aspect of Nature-Study," illustrated by the very attractive cut of Jerry Mickle's museum. It was an article which I was more than glad to read over a second time, for it carried me far back to my boyhood days, when some of the shelves in my room at home had much the appearance of Jerry's museum.

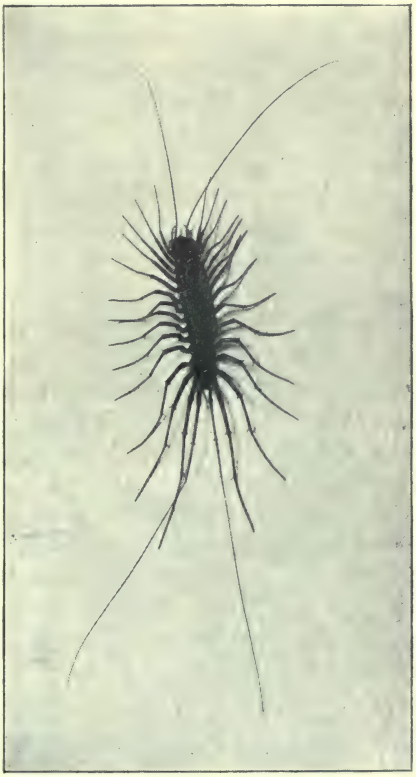
It is very evident that this youngster is being duly encouraged in his nature studies and in the formation of the collection of the various objects he is accumulating on his tramps and from other sources. This was by no means the case in my early career. I was one of those boys that the more my father threw in the way, the harder I worked to climb over the obstacles. My mother's smile when I succeeded fully repaid me for any such discouragements; and, although her smiles were bestowed upon me more

than half a century ago, I believe there are still times when they have, even now, their due effect in encouraging me in my work when things do not go quite right—indeed, I know they do.

I have carefully studied the illustration of Jerry's museum especially the animal specimens he has brought together. There are not a few things in it which he will soon learn to do a little better, and possibly I will call attention to them in some future article. I may say right here, however, that one of the principal things that demand his attention is the better care of the insects he collects, particularly the moths and butterflies. Several of these he has pinned up on the wall are mutilated and otherwise imperfect. His next investment should be a few helpful books on such subjects—books giving full information as to how to go to work in the *right way*; for it is just as easy to do things the right way as to do them in an entirely wrong way. There are several excellent works on the proper methods to be followed in the collecting and preservation of all kinds of insects; also elementary works on taxidermy; the scientific manner of preserving, studying, and arranging all kinds of specimens of animal forms, as well as plants, and so on. But, as I say, later on I trust to publish in the REVIEW some of my own methods in such work, adapted to the needs and requirements of boys of Jerry's age—maybe even of those not a little older.

Speaking of insects, I may say that there are few departments in the biological sciences that offer more interesting material for study than does the enormous host of forms that go to make up this division of animal life in nature. We find them everywhere, and we soon come to appreciate the fact that the hundreds of species found in any region or locality in this country fall naturally into three classes: the aquatic insects, the semi-terrestrial ones, and the strictly terrestial species. Another charm about the study of insects is the fact that, even among some of the most abundant kinds, there is yet so much to learn of which we practically know nothing. Life-histories of scores of our commonest forms still remain to be written; and the only way in which the material for such productions can be scientifically observed is by studying those forms in nature, and by keeping them in vivaria and aquaria at home, the conditions being as nearly as possible the same as those they enjoy in their several environments in nature.

I invited special attention to this in a paper I read, sometime since, at a meeting of the Aquarium Society of Washington, on the aquatic insects of the District of Columbia. Upon reading some of the chapters in Dr. L. O. Howard's most useful volume, "The Insect Book," one is surprised at the number of species requiring more or less extended study. For example, speaking of such common forms as the dragon-flies, he says: "There is still some doubt as to the exact method by which they begin to breathe air after leaving the water, and it is a subject which will bear much further investigation." Again, under his history of those very interesting and most abundant species the larvæ of the caddis-flies, he remarks: "As common as are the caddis-worms, and as often as they have been watched in streams and in aquaria, not a single full life history has been recorded in this country, and a fascinating field for original investigation is therefore open to the first comer." I may say here that simply hundreds of our most abundant insects stand in the same case. Indeed it would be well were more people to know further of the life histories of the commonest species of insects that occur daily under their very eyes in the homes all over the country. Take for example the common "thousand-legs"—it has but fifteen pairs by the way. How few there are that know of the value of this particular insect! Last summer I caught in my dining-room a particularly handsome



A "thousand-legs," *Scutigera forceps*, frequently found in our homes.

specimen of one of these useful forms, and here is a reproduction of a photograph I made of it at the time. This I secured by placing a long pasteboard box over it until it was perfectly quiet and in a normal posture, when I photographed it by arranging my camera directly over it, cautiously removing the aforesaid box. My best photographic pictures of many insects and other creatures are obtained in this way. In this case the insect is natural size, and it gives a beautiful and lifelike representation of the species, which bears the scientific name of *Scutigera forceps*. We often see one running nimbly up the wall, or scurrying across the floor. In only too many instances some one crushes the little fellow under foot, wisely (?) remarking that "the bite of one of those centipedes or earwigs is certain death to the person so bitten." There is absolutely no truth in such a statement; upon the other hand, the *Scutigera* is a most useful species to have about, as its carnivorous tastes lead it to continually prey upon house-flies, cockroaches, and other pests of the home. We all know what a menace to health the common house-fly is, while cockroaches are by no means desirable additions to any household.

One of the most interesting groups of insects to study is the dragon-flies, especially, as I have said above, as there is so much yet to be learned about them, of which science has no record. Not a summer goes by but what I capture and study some of these truly elegant insects. In eastern North America some of our biggest forms belong in the family Æschnidæ, and in this assemblage one of the very largest and most powerful species is the one called *Anax junius*. A fine example of this ferocious fellow was caught by me not long ago, and photographed, natural size, on a beautiful head of wool-grass; it is here reproduced in a figure. Note how the eyes meet on top of the head. This big dragon-fly is the first species to appear here in the spring in the District of Columbia, and the last to disappear as winter comes on. They may be seen darting about over almost any pond or marsh in search of the various flies and other insects upon which they prey; and every once in a while we catch a glimpse of their beautiful blue and green bodies, as they swiftly turn in the right light.

Another fine species of dragon-fly is shown in Fig. 3; it is known as *Libellula pulchella*, and appears in numbers early in the summer. It is a brown form, and may be readily captured with an ordinary insect-net. Then we have the fellow with the chalk-white body

One of our largest Dragon-flies (*Anax junius*).

and large, dark areas upon its wings. This is the *Plathemis lydia*, and it is a very striking form. Many people call these most graceful and attractive insects "devil's darning-needles"; but for what reason it is hard to say. Superstitious folk have given them the thoroughly undeserved name of "snake doctors"

or "snake feeders"; while in England, where many species are found, the country people call them "horse-stingers," believing that they sting the horses, which is simply an empty slander. No dragon-fly ever stung a horse in its life, any more than it sewed up the ears of a bad boy, which many believe to have happened.

Dragon-flies are, without exception, aquatic in the early stages of their existence, the larval stages being known as "nymphs." Their history is extremely interesting, and they do not look one bit like the adult insect. One may easily secure examples of them for study in almost any good-sized pond in the country where dragon-flies occur. Doctor Howard tells us that "The nymphal dragon-flies are well adapted to aquarium study. They are easily collected and easily kept. The debris at the bottom of ponds can be brought up with a rake, and the nymphs thus collected placed in a bucket and carried home to the aquarium, which should be furnished with sand and aquatic plants. The best time for collecting them is in the spring and summer."

The entire group is known as the *Odonata*, and some 2000 of them have been described, about 300 of which occur in this country, though only 250 are peculiar to it. Sometimes upwards of half this number of species may be collected in some particular State, as nearly 100 occur in the insect fauna of Indiana alone.

I might tell you a great deal more about dragon-flies, and I will be glad to do so at some other time; but just now I desire to invite your attention to another insect, of which I captured quite a number the day I took the big dragonfly shown on the wool-grass-top. I do not refer to the fine male "Katydid" shown in the figure at the head of this article, but to the five beautiful beetles seen on the blackberry stem in the figure at the end. These I captured just as you see them one summer's day in Maryland, on the shores of Chesapeake Bay, about an hour and a half's ride by rail from Washington. There were several hundreds of them on the blackberry bushes along the roadside, feeding upon the juices of the dead-ripe fruit. This beetle is of a fine green color, rather dark, the elytra being smooth and as hard as those of the Spotted Pelidnota (*Pelidnota punctata*), or of the Goldsmith-Beetle (*Cotalpa lanigera*). It appears to be related to the Bumble Flower-Beetle or Indian Cetonia (*Euphoria inda*); but it is not described in Howard's Insect Book, or in any other elementary work on entomology which I have casually

looked over. Perhaps some of the readers of the REVIEW can name this beetle. A few years ago I found over forty of them in a

Beetles feeding on ripe blackberries.

roundish patch, closely crowded together on the trunk of an oak-tree; they were apparently partaking of the sap that was escaping from some injury the tree had received.

The Fly Campaign in Springfield, Illinois

ISADORA BENNETT

Member of the Zoölogy Class of the Springfield High School.

Many, many cities have waged their wars on the house-fly, and have met with more or less success. Springfield, too, has had her fly campaign,—and won,—won, because, while she has not completely routed the invader, she has learned to put forth organized and concentrated effort. She has learned the method of his tactics, located his magazines, crippled his batteries, and opened the gates of his citadel. And this is victory. The actual war with the fly can have but one termination, now that we have conquered our greater enemy,—the enemy within our gates. We fought our hardest fight to convince the type of "Doubting Thomas," whose chief business in life it is to promptly and religiously condemn all that is new, and, especially, all reform. Our campaign, then, was, largely, a campaign for education, and to win the confidence of the public. Without these we could accomplish absolutely nothing, —and with them—everything! But we have fought our fight, —and it was a good fight. We have won the confidence of the people, and with their help have found for Springfield the means whereby she may solve her problem. The day of the campaigner is done. Now it remains for us to watch as the forces we have inaugurated move to their ultimate conclusion. We believe that the main purpose of the campaign has been accomplished, that the campaign, itself, is history, and that we may now recount that history.

The war on flies in Springfield began in December of 1913. It was carried on by the Biology Department of the High School, under the leadership and guidance of Miss Nettie M. Cook, head of that department. Encouraged and supported by the other classes, the Zoölogy students, from the first, took on themselves the responsibilities of the undertaking, and, at the end, carried it to success.

We were prepared for our work by a careful study of the house-fly, his life, his habits, the dangers he represented, possible means of extermination, and the most practicable methods of fighting him.

Then the time came for action. As the undertaking was to be purely a school activity, our only way to reach the public

was through the schools. So, in the beginning of our long war, before we were recognized or received, we proposed to interest Springfield through the medium of her school children. But, first, we must interest the medium,—and we began in the High School. We advertised the campaign in every way, we could,—direct or indirect: we spoke of it to our friends; and those of us, who were in the Public Speaking Department reported on it as a current topic, dealing with every phase of it separately, so that we could bring it before the classes often. After we had, in this way aroused a casual interest, representatives of the Zoölogy classes spoke in all the session rooms during the roll call period, telling of the work we wished to accomplish, and asking for support. The pupils were characteristic in their response,—characteristic of a group called to action: they gave us their nominal support, but preferred to be "conservative,"—to "wait and see how things were going to go." But we had gained our main purpose: we had aroused a lively interest. They would not be concerned in our progress, but they were close observers, and—they commented. This was the thing, we desired most,—that they should carry the news outside the school—to their parents and neighbors. Even if they did not favor us, at least, they noticed us, and we could win their favor, in time.

Our next move was to interest the grade schools. Each member of the class was required to design a poster that would be, at once, attractive and forceful. We were allowed perfect freedom in working out our ideas. That was the characteristic attitude of Miss Cook throughout the whole campaign. Every campaigner was made to feel that his was a very important part of the work, that the little task assigned to him was the most necessary of all. He was perfectly free to do it in his own way, but he was so charmed and enthused by his own importance that he did *it*—and more. No good idea was ever overlooked, and this gave us an incentive to think of new ideas and work them out by ourselves. We were made to feel an individual responsibility, which, I believe, accounts in a great measure for our enthusiasm, and, therefor, for our final success.

As soon as the posters were finished, they were sent to the various grade schools throughout the city. They were hung in the halls without any announcement, without so much as a word of explanation. Immediately, the greatest curiosity was aroused.

Crowds would stop in the halls and pass conjectures as to "who put them there," with the inevitable question, "what are they for?" The posters, themselves, were large sheets of cardboard, decorated, and lettered by hand. (Our Art department would never have owned them.) Our main reason for not having them printed was that there were no finances, supporting the campaign,—a very good reason, as must be seen. However, we gained another advantage by this economy that we did not, perhaps, appreciate at the time. Indeed, these succeeded where printed posters, or handbills might have failed. For certainly, no one can deny that a large, white card with some sort of strange picture drawn on it—probably by a friend one was interested in—and some printing, too, —that one could hardly read at all, without stopping to investigate—was a very interesting thing, and worthy investigation. And they did stop, and they did investigate. This, of course, told them nothing of the campaign, but it prepared them for the announcement that was to come later,—that the campaigners would send a speaker to give a short lecture at the next Patrons' Club meeting. Ours is a large, central high school, drawing its pupils from all parts of the city, and, for this reason, it was possible, in nearly all cases, to send as representative some member of the class who had previously graduated from that school, or who was well known in the district. When the announcement was made, the child rushed home with the news that "Mary Ann Jones was coming to school next Thursday, to give a speech at the Mothers' Club." The promise of a lecture on the fly was, probably, the least alluring one they could have made, and, I have no doubt, many, or most of the "patrons" came simply to see their friend perform,—but they came.

These lectures were about fifteen minutes in length, and dealt with the principal discoveries concerning the fly, the dangers that carelessness in the matter involved, the fly's habits, and ways of exterminating him, together with some explanation of the campaign, itself, and a few unavoidable words in its behalf.

It was our task to shock an over-indifferent public into a realization of its duty, and we were to do it by means of these lectures. We quoted awe-inspiring statistics; we dealt with "loving exactness" on the habits of the fly in all their horrible details, and we duly shocked our public. And the most horrible parts of the lecture were the parts they remembered,—and told. They were

shocked themselves, and, because they wanted to see the effect on their neighbors, they repeated these facts, greatly to the edification of the neighbors, we hope. Then these facts were told, and retold, until the statements became so warped, and the guilt of the fly reached such magnitude that it should have shocked that shameless insect, himself. But the little girl, who shudders and turns away when she is permitted to view her playmate's sore finger, that is put on exhibition,—always turns back for another look. Likewise our public: the more they heard, the more they wanted to hear. Then enjoyed the sensation. Finally, they had developed such an appetite for these ghastly facts that no statement would satisfy them.

But, through all this, they came to feel a personal interest in the campaign; they were most eager to help in the work. The Patrons' Clubs took action almost immediately. Committees were appointed to look into conditions in each district, and these committees accomplished a great deal, later. In our city, the powers of the health commissioners are decidedly limited. If they find the most dangerous and unhealthful conditions existing, they may only advise a change, and offer help;—they may not order the owner to clean up the place. Then, it must be clearly seen of how much help these committees could be. They reported all the cases that they found in their own districts, and under the stress of public opinion, and, sometimes, even of boycott, the owners were forced into compliance with the somewhat strenuously voiced demands of these ladies.

But it must be understood that this was not the work of a few days, or of a few weeks, but the work of about six months. And though we sent speakers to the schools whenever there was a meeting of the Patrons' Club, in the meanwhile we were working along many different lines.

The posters were sent along a regular circuit. A set of two was kept at each school for two weeks, then sent to another school, and replaced by new ones. The posters became very popular with the children. They got to expecting them each fortnight and wondering what the next ones would be like. And, before they realized it, they had graduated in a complete poster course on the fly.

But, as yet, the one great need of the undertaking was systematic co-operation of the actual staff with workers from the outside.

These citizen-workers were energetic, and eager, but their efforts lacked organization. Their endeavors could not yet be called a campaign,—it was nothing more than a general awakening to a condition long ignored, and a disorganized attempt at action. It was Miss Cook, who originated a plan for systematic reporting of uncleanly districts to the Board of Health. In each school a number of "Junior Sanitary Police" were elected. They were assigned each a certain block, within which they were to investigate objectionable conditions, and report them. Such conditions were designated by crayon marks on maps of the districts, showing lots, alleys, etc. On this map, the Junior Sanitary Police marked the particular place with a dot of a certain color that stood for the kind of filth found there. For instance, if the police wished to report in cans on the back of lot 103, he found lot 103 by the streets bounding it, and marked the back end of the lot with a yellow dot.

Another, and one of the most important activities of the campaign was in progress during all this time. It was the work of newspaper publicity. A committee of five had charge of this work but the contributors might be any students of the Biology Department. In the first months of the campaign, the public did not receive us wholeheartedly, and, naturally, we found no favor in the eyes of city editors. But the printing of the activities of various clubs and societies has always been favored by the public, and the editors had no intention of discontinuing this custom, and, moreover, they had no suspicion of danger from this quarter. This was an oversight on the part of the worthy gentlemen, for we took just that means of gaining publicity for the campaign. No matter how insignificant, everything that was accomplished, every speech that was made, together with all announcements of the committees and outlines of the work, found their way into either the "Societies" section of the papers or "The High School Notes," without the realization on the part of the editors that they were advertisements for the campaign. Then, as time went on, we won our reception from the people and the editors began to realize that the campaign was really succeeding and popular. The first to offer us space was the editor of the *State Register*. The others were not ready to accept the movement, even yet, and one paper actually refused to print any article. The editor of the *Register*, however, offered us as much space as we wished to use for any articles telling of the cam-

paign. We made free use of our privilege. We followed the introductory article with a series of more interesting "reader" articles. They were "catchy," bright, and usually in story form,—as, for instance, "the History of the Fly." Then we published a number of "Everyday Proverbs," consisting of sayings of "Poor Richard," maxims, and adages made over into slogans for the fly campaign. Then these were followed by a set of "Everyday Parables," patterned after Aesop's fables, and having, as their "morals" the truths expressed in the "Proverbs." Our articles became popular with the reading public, and we had the satisfaction of receiving a request for articles by other papers, and even from the paper that had refused to print them, before.

By this time the campaign had proven itself a success. The committees of the Patrons' Clubs were doing excellent work. They forced the owners of stables to keep them reasonably clean, and they compelled one dairy to adopt more sanitary methods. The Metropolitan Insurance Company got out very instructive posters which were scattered broadcast over the city. The Manual Training Departments in many of the schools made swatters. A fund donated by the business men bought six thousand swatters to be distributed in the schools. The Utilities Company gave swatters to its patrons, and, since then, many other Springfield firms have done likewise. On a certain day, set aside for the purpose, the Gayety Theatre gave a free matinée to the school children, showing fly films. And the Utilities Company furnished free transportation on street cars for the schools to attend, each at a set time in the day. From that day to this, Springfield has been most eager to be rid of flies. Thus the work of the Biology Department, in starting the campaign was finished, and other willing hands have been ready since, to carry on the work.

The war on flies in Springfield is important not only as a fly campaign, but also as an agent in producing a tendency to be "alive" to the problems of civic duty. It opened our eyes to the need of inspection of milk and foods, the cleaning up of alleys, a generous support of the Anti-Tuberculosis movement, and, finally, the formation of the Springfield Improvement League. Into the hands of this organization we have consigned our feeble efforts, with the sincere wish that they may, some day, make Springfield a "Flyless City."

Correlation Between Nature and High School

GEORGE W. HUNTER

Wishing to obtain some first hand information relative to the condition of the teaching of biologic science in the secondary schools of this country the writer sent out to the leading high schools in the cities and larger towns in the United States a questionnaire on the method, purpose and content of biologic science in the high school. This questionnaire went for the most part to cities of 10,000 inhabitants and over. The answers received may be said to fairly well represent the actual conditions in urban high schools the country over. The county or township high school sent answers in the proportion of five to about 300 answers received. The subject matter forming the basis for this paper was obtained from the answers sent in to the following question: "Assuming that you have nature study in the grades, to what extent do you correlate the grade work in nature study and human physiology with the biology of the high school?"

The answers received were grouped geographically under the headings New England, Middle, Southern, North Central, Rocky Mountain and Pacific States.* One hundred and seventy-eight schools, representing thirty states reported on this question. Of those schools 110 reported no correlation whatever between the nature work of the grades and the high school, 49 report slight correlation, and 19 schools, several of which are private institutions having a continuous course from elementary to high school, report rather complete correlation.

The following figures show the answers of the state groups reporting.

	Correlation	Slight Correlation	No Correlation
New England	3	8	22
Middle	5	15	31
Southern		3	2
North Central	11	17	50
Rocky Mountain		4	4
Pacific		2	1
	13	49	110

The above figures show that less than 11 per cent of the schools answering the questionnaire report correlation to the extent of basing the high school science, especially biologic science, upon the foundation laid down by the nature study of the elementary school.

If we believe that correlation of a general nature ought to exist, and most of us do believe this, then this report is not of an extremely encouraging nature. The nature study movement is still young but should not better results be attained than these figures seem to warrant? And, if this state of affairs does exist, what are the reasons for its existence from the high school teachers point of view.

Reasons why the correlation is not undertaken, or when undertaken is not successful.

The following answers, taken at random from those sent in, will serve to show the factors which mitigate against successful correlation.

"Work in the grades is not uniform, therefore no correlation." This is a rather frequent reason given. Boston high schools report that "the nature work in the various schools feeding our high schools is so various that we cannot correlate." A St. Louis school says "Nature Study is so unequally developed, depending upon the training and preference of grammar school principals and teachers that we cannot depend upon anything definite." A New York high school teacher writes "the nature study differs so much in the various schools that it is almost useless for building material." From Missouri, Ohio, Michigan, New York, New Jersey and several other states is the cry of lack of uniformity in the nature study work.

Another objection, closely allied to the above objection to nature study as now given is lack of system and of organization. Massachusetts, Michigan, Missouri, and Ohio all make this objection.

A third comment is upon the method of presentation. Numerous schools say that the nature work consists largely of reading or "book work." To such preliminary work the science teacher naturally enough, can give little attention.

Another valid objection, and a rather universal one, is that some schools feeding a given high school may give the work while another may do absolutely nothing with the work. This of is

course due to the lack of departmental work in the elementary schools and individual preferences of teachers, some of whom, by training or temperament do not make good teachers of nature study.

One rather surprising statement, repeated by several high school teachers in various states is that "very little of the nature work appears to be retained, forming a slight basis for science work." This surely inveighs against *methods* of *presentation* rather than the material worked with or upon.

Two or three other statements taken at random, will throw some light upon one or two other factors in this correlation problem. "The two lines are so utterly divergent in manner of presentation that no attempt is made to make connection." "The nature work is still in an experimental stage. It is not to be depended upon as all pupils do not get it." "It is not sufficiently developed to be of use."

Teachers of science appear to be very sure that nature work, properly directed and organized would be of immense value to the pupil who continues science work in the high school. Especially is this true of elementary physiology, which although not strictly nature study, might be made much more useful if it could be in some manner correlated with the nature work. The following quotations serve to illustrate the feeling in this regard. "No doubt the nature work aids the pupil in his science work." "If properly taught, nature study would greatly aid our students in their science work." "The nature work does not aid us greatly." "The human physiology is of greater advantage to the pupil in his biological work in the high school."

Let us now turn to the answers from schools which report correlation in order to see wherein this correlation consists and to what extent it is carried out.

Worcester, Massachusetts reports "Nature study is used as a foundation for the science work which follows." New Bedford, Massachusetts, "We make the grade work the starting point and human physiology the goal." Sault Ste. Marie, Michigan, "Grade work is the basis, we build on it a continuous higher course." Concord, N. H., "We try to place and arrange scientifically the knowledge already acquired." Some New York schools, two of them large private schools, report "the work in the elementary school is the foundation on which we build our high school

science." "Nature study is an introduction." A western city says "Nearly all our elementary teachers have had courses in biology and carry out the same methods of instruction (experimental method) in grades as in the high school."

Personal experience in New York City, where the correlation in most schools is very slight, shows that pupils who have had experimental science as is given in some of the elementary schools of the city (where a special teacher gives instruction under the departmental system) come to their biological work with an entirely different mental attitude from pupils who have not had this training.

It is not the purpose of this paper to suggest methods of improvement in nature study but some very evident lines of improvement are open, if this report means anything. Expression of opinion has been freely given, and some of the criticism obtained is just. The past decade has shown great strides in the direction of the introduction of nature study in the schools, the obvious suggestion arising from the data previously given would indicate that the teachers of nature study should next attack the problem of subject matter and point of view. More uniformity of subject matter and in presentation, less time devoted to *reading* about nature and more time to experimental work of a simple sort, the correlation of nature work and elementary physiology, the introduction of cyclic work of a kind that will have ultimate bearing on the problems of life, and last but not least, the proper training in the normal and training schools for the *teaching* of nature study; these are some of the problems which the leaders of the nature study movement might well devote their energies during the next decade of nature study development in the elementary schools.

It is interesting to note that since this paper was written several years ago (and then filed away and forgotten) that several recent papers by Bigelow, Trafton and others take up some of the problems referred to in the last paragraph. The paper is submitted for its historical value in giving evidence rather than from any attempt to bring new ideas before the readers of the NATURE-STUDY REVIEW.

The Crow

A Kindergarten Story by ALICE MCKAY

Jimmy Scarecrow's Story

Here I am way out in the corn field. How would you like to be me? I'm Jimmy Scarecrow. Do you know why I'm here? Farmer Busyman set me here some time ago. He said, "Scare them away, little fellow; scare them away." To be sure he meant I should scare the crows. Don't you think I look fine in Farmer Busyman's yellow straw hat and his big brown coat?

"Caw,—Caw." Do you hear that? "Caw,—Caw." Look high, high up in that big strong tree. Could you climb way up nearly to the top? There's a cradle up there but there's no one in it just now. It's made of sticks and strips of grape vine bark and grasses woven together.

Not long ago, the soft winds rocked five wee crow babies who were fast asleep in that cradle. Not so long ago Mother Crow lined that nest herself. What do you think she said? "My dear, naked birdlings must have a soft warm cradle, so I'll find some moss, and fine rootlets for the inside." You see the little nestlings have no feather-dresses when they come out of the shell. They have to wait for their clothes to grow. You see, each crow-baby has only one suit of clothes at a time, and he washes and dries that without taking it off.

Of course, I'm Jimmy Scarecrow, and don't care to eat, but those crow birdlings surely were the biggest eaters. I think you just couldn't find hungrier babies. Indeed, I heard that they looked as though they were all mouth. And what do you think they liked, and still like?—nice juicy caterpillars—and—Junebug larvae! Mother Crow, herself, likes sprouting corn, and she knows where to find it. Indeed, she does. Do you see all those little corn plants about me? Mother Crow doesn't seem to mind my standing here. She says I'm only Jimmy Scarecrow. Very often, down, down, she would fly, and up, up she would pull the tiny corn stalk, and swallow it whole. Crows are strange birds.

Why, will you believe me, they think frogs and mice and fish are far better than ice-cream. They eat, and eat, and eat.

But one day I heard a crow baby say, "You're crowding me," and another little voice said, "Oh, I'm so crowded," and still a third wee one cried out, "So am I." Mother Crow had to shake her beak at them. "Caw—caw. Will you be good babies!"

Just then she thought of something, so she said, "Now come along. Stand right here on the edge of the nest, every one of you." And, to be sure, first five black heads, then five black bodies, then five pairs of weak legs came out of the nest. And as sure as my name's Jimmy Scarecrow, one of those five queer, top-heavy children stepped out upon a branch. I knew he would tumble, and tumble he did. But wasn't he surprised to find himself resting on the branch below! He remembered then, that his wings had gone up and down, and up and down just as his mother's always did. Surely a prouder baby crow never lived. In a few days all five were playing tag in the tree-top.

Now let me tell you one thing more. I heard Daddy Crow say this to his babies, "Do you see him? (and he pointed right at me.) That's Jimmy Scarecrow. He just stands still, right there in the corn field. Don't you be afraid of him." At first I really didn't know just what to do. Think of their talking about me like that. I thought a while—and then, what do you suppose I did?—I just laughed a great big scarecrow laugh, and watched the black babies flap their black wings above my head.

FINGER PLAY

(Left hand)

Five little crows on a branch in a tree.
Said the first little crow,
"What do you see?"
Said the second little crow,
"A worm, I declare."
Said the third little crow,
"Oh, brother, do share."
Said the fourth little crow,
"I wish I could fly."
Said the fifth little crow,
"Oh, yes,—So do I."
The limb gave a snap.—(Clap hands)
And away they flew.——"Flap,—Flap,—Flap."

Chestnuts in Burs
Photo by Verne Morton

November Nature-Study

ANNA BOTSFORD COMSTOCK

"Again the leaves come fluttering down,
Slowly, silently, one by one,
Scarlet and crimson and gold and brown,
Willing to fall for their work is done."—*Allerton.*

One of the duties we owe to children is to instil into their minds the special charms of each passing month. The dread of winter, of rain, of snow, of wind, and of all the natural phenomena that make the old or weak shiver, is morbid, and should never be expressed before children. In themselves, all of these phases of the weather are useful and beautiful and it is we ourselves who are out of tune. Much has been written of the melancholy of autumn, and the sadness of the falling leaves, when gladness would be a nearer expression of the leaves' feeling, if they have any; for they must be glad to go sailing on the wind, glad to settle down and make a warm carpet for the living, sleeping things below, and glad later to enrich the soil as they decay.

SECOND GRADE

Nuts.—A special study of the nuts which in November are gathered by us, and by the squirrels and chipmunks has a personal

interest. Chestnuts, hickory nuts, walnuts, butternuts, beechnuts, and hazel nuts all give a great interest to our walks in November. The observations to be made about nuts are: To know their names, and to recognize the trees on which they grow; how they are protected while growing; how they become loosened in order to fall; the point in the shell of the nut which was connected with the branch or burr; whether the shell of the nut is thick and hard or thin. Compare the shells of the chestnut, hickory nut, and butternut, compare the "meats" of the three kinds. In each case find the "sprout", the part that will germinate and its relation to the other parts of the meat, which form the lunch put up by the mother tree for the baby, when it starts to grow, as Uncle John Spencer used to say. Above all, impress upon the pupils that the nuts are to the tree what children are to their parents.

For the lesson on the chestnut, use obs. 3, 4, 5, p. 760.* For the hickory nut, obs. 13, p. 756. For the horse-chestnut, part of obs. 5, p. 764. Read to the class the story of the Beechnut in the October NATURE-STUDY REVIEW.

The Milkweed Pod and Seed.—It is in November that the milkweed releases her seeds from her treasure chest of jade, in which they grew. For this lesson use milkweed pods that are mature but unopened. The pupils should make the following observations:—The pod opens along a selvage seam; it is rough on the outside, satin smooth on the inside, the coarse fibres between; within the pod is a long object covered with what seems spiral rows of seeds. Lift out one seed and watch the pappus expand into a little balloon. Drop a seed with balloon expanded on the water. Note it floats until the pappus gets wet. Cut off the balloon part and drop a seed on the water. It still floats for it has a cork life-preserver around its margin. With the scissors cut off this margin, and the seed sinks.

A story should be told about the adventures of a milkweed seed from the time it leaves its pod until it finds a place in the ground to grow. This should include the reason why the milkweed attaches balloons to its seeds. The story should lead to the study of the milkweed plant next summer.—p. 542.

Other Seed Balloons.—After studying the milkweed balloon, it is well to observe other seeds that are thus carried through the air.

*When the title of the book is not given, the reference is to be found in *The Handbook of Nature-Study.*

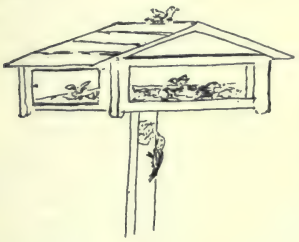
For the study of the thistle seed, use as much of obs. 7, p. 565, as the children can understand, and see p. 564 for descriptions. For the dandelion parachute, use obs. 9, 10, p. 575. The children should be encouraged to hunt for other seed balloons such as those of the asters, goldenrod, cat-tails, and many others. After these seeds have been observed, the reason for their balloons should be explained in the form of a story, if possible. Two facts should be impressed upon the child's mind by this story. First, that any seed in order to grow must find a space of ground where it can find room and plant food for growth. Second, that in the locality around these mother plants, the surface of the earth is already crowded with other plants. If all the seeds of a thistle, a dandelion, or a milkweed should fall close to the mother plant, probably none of them would be able to grow. But the wind carries them far away, attached to their balloons and they may drop upon more favorable sites.

The Burdock Bur.—This is simply another illustration of a plant that fits its seed for travelling in order that it may find a place to grow. Note the hooks on the bur and how well fitted they are to catch hold of the passerby. Take a bur apart and note the number of seeds carried inside. For this study, use obs. 8 and 9, p. 569.

THIRD GRADE

The Pumpkin.—The pumpkin is a beautiful fruit and it is lucky for the wayfarer that it grows on a vine instead of upon a tree. Even an apple hurts when it hits one on the head, and we should need to wear steel helmets if we had to pass under a pumpkin tree. In studying any fruit, the attention should be focused upon the seeds and their protection. For this study of the pumpkin use obs. 1–8, pp. 682, 683; see also pp. 679 and 680. The squash may be studied with the same questions. The pumpkin, like the corn, should be a link in the child's mind, connecting our present history with that of the past, for the pumpkin was cultivated by the American Indians long before white men came to America. Its native home was in a much warmer climate for it can not sustain itself in most of the United States. Every child that enjoys a piece of pumpkin pie ought to send a grateful thought to the Indian that gave to us this fruit.

Burs.—November is the month when most of the mother plants hasten to send their seeds forth so that they may nestle to the earth before the coming of the snow. A collection of those seeds that catch hold of the passerby, properly labeled and mounted upon a card, make an interesting exhibit. After a walk in the fields, our clothing may give us such a collection of "pitchforks" and beggars' ticks and burdocks. Each specimen should be studied to discover how many seeds it contains, and by what means it catches hold. These "tramp babies" should be examined through a lens in order to understand their cunning. While a lens is not absolutely necessary in Nature Study, it is a great help often. A lens, chained to a desk in the schoolroom, is the safest way to inaugurate the use of this instrument in Nature Study.



Bird-feeding Stations.—In November, especially about Thanksgiving, is just the time to begin giving the birds food, and thus showing our friendliness. The simplest way to begin is to tie beef-fat to branches or to tack it to the side of a tree in the neighborhood of the schoolhouse. Beef-fat is better than suet as the latter crumbles so quickly. A feeding shelf may be any sort of a shelf fastened to the side of a tree or set on a pole. However, it is better to place a roof over the shelf to protect the food from rain and snow. Dimensions and drawing plans for feeding shelves may be had by sending to the U. S. Dept. of Agriculture at Washington, D. C., for Farmers' Bulletin, 609. Sunflower seeds, unbaked peanuts, hemp seeds and millet are the most attractive seeds that we can offer to the birds. An important point in locating a feeding station is to place it where it may be observed without disturbing the birds.

The Chickadee and Nuthatch.—These two fascinating birds will probably be the first to visit the feeding station. Their resemblances and their differences offer the best illustration possible for teaching the children to observe closely; and to help them to form an intimate acquaintance with a chickadee is giving them a permanent source for future happiness. I speak with feeling, for I was three years old when I first made the acquaintance of this fascinating birdling, and through a long life, the chickadees have

given me each year joyful companionship. If I am late in putting out the food in the fall or neglectful in replacing it later, my chickadees follow me around the garden and cheerfully but firmly remonstrate with me, "Don't you see, see, see, we are hungree, gree, gree?"

For lessons on the chickadee, use obs. 1–7, p. 68. Obs. 8 and 9 should form the basis for a story about the chickadee. The Chickadee Song in Nature Songs and Stories by Katherine Creighton will be a very delightful addition in this lesson.

The nuthatch lesson is covered by obs. 1–8, p. 64, 65. Obs. 9 and 10 are for material for a story. In both these lessons, the questions should be given a few at a time and answered by the children through actual observation.

Garden Seeds.—A collection, mounted on cards, or contained in small vials of all the seeds found in the garden in November will prove very instructive. This collection should consist, first, of the seeds of the garden plants, and second, of the weeds that have grown and produced seeds in the garden. The questions to ask about these seeds are: How are the seeds protected? How are they scattered, and what kind of plants produce them? This is an excellent preparation for gardening.

Sunrise and Sunset.—A beginning of accurate observations upon the sun should be made in the third grade. The children are old enough to tell the time by the clock and make the records. A chart may be placed on the wall having blank spaces for one or two observations a week on the time of sunrise and of sunset. This will show the rate of the shortening days. There should be a correlation of these periods with daily life. The first week in November the sun rises something later than 6:30 just the time we are getting out of bed, and it sets not far from 5:00 o'clock, before we have supper; but during the last week, it rises just before 7:00 and sets about 4:30, long before we wish to stop playing.

FOURTH GRADE

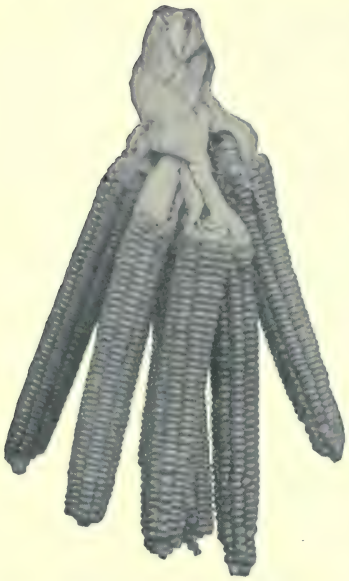
November is the accepted month for that elusive season, called Indian summer, and the pupils should be taught to look for it and enjoy it, and thus add to their spiritual assets, for Indian summer is surely a season appealing to the finer sensibilities; to feel it and enjoy it cultivates a spiritual comprehension. It is the season when the

"Light of dreams around the year in golden glory lies;
The Heavens are full of floating mysteries,
And down the lake the veiled splendor beams.
Like hidden poets lie the hazy streams,
Mantled with mysteries of their own romance,
While scarce a breath disturbs their drowsy trance."
(*Thomas Buchanan Read*).

"Linger, oh day,
Let not thy purple haze fade utterly away.
The Indian summer lays
Her tender touch upon the emerald hills.
Exquisite thrills
Of delicate gladness fill the blue-veined air,
More restful even than rest,
The passionate sweetness that is everywhere."
(*Alice M. Rollins*).

Witch-hazel.—The starry hazel blossoms which brighten the woods of November are well worth careful study and as a matter of dynamics, there is scarcely a firearm of modern warfare that can shoot so far in comparison with its size as the husk of the hazel shoots its seed. Forty-five feet is a record distance for this little projectile. The lessons divide naturally into three; a study of the shrub in the woods, obs. 1–5, p. 812; a study of the blossoms, obs. 6–10, p. 813. In addition there should be an English theme giving the legends of this shrub.

Corn.—It is best to begin the study of this beautiful and beneficent plant when its golden store is garnered and its brown leaves on the scattered stalks and stooks shiver in the wind. The autumn lesson on the corn may be found on p. 665. A cornstalk should be brought to the schoolroom for study and it should show the true roots and the brace roots as well as the leaves. For study of stalk see obs. 1–9, p. 665. The study of the ear should be given in another lesson, obs. 12–16. In connection with this should be read or recited the Corn Song by Whittier and Columbia's Emblem by Edna Dean Proctor. On p. 660 may be found material for a story



of the history of the corn. All these lessons should be a preparation for a study of the growing corn in the fields and gardens next summer as outlined on p. 666.

Bobwhite.--Whether this charming little bird has been exterminated or not in your region, it should be made the subject for a lesson. If it has survived, then encourage field observation by individual pupils, asking them to report to the class. The quail are most beneficial birds since they feed on insects in spring and summer, and on weed seeds in fall and winter. There is some hope that with attentive care these friendly little birds may be brought back and again make their homes in our fields. To establish these birds, they must be provided with a field in which there are clumps of sumac, wild-rose, blackberry bushes, or young pine woods. The ideal shelter, with food combined, is made by laying down upon the ground for several yards square, first a pile of weeds and chaff, or hayloft sweepings; over this should be placed a layer of stiff brush; and over all should be piled a layer of coarse weeds, cut before the seeds drop; these may be ragweed, pig-weed, dock, wild-sunflower and the like. The brush should be left exposed on the south side. Fresh supplies of screenings should be thrown intothe brush at frequent intervals during the winter.

There should be three English themes written upon this bird as follows: How the quail benefits the farmer. The nesting habits of bobwhite. How we can induce bobwhite to live in our fields.

References.—Useful Birds and their Protection, Forbush. Bob and Some Other Birds,—Wild Life in the Rockies, Enos A. Mills. Birds of New York—Vol. I, Eaton and Fuertes. Pet Book, Comstock.

English Pheasant.—These beautiful birds have been introduced into many parts of our country and it is surely a wise plan to interest the children in them. As in the study of the quail, it is best to begin with actual observation, giving an account of its appearance and habits. Then should follow English themes on:—The history of the English pheasant. The way to feed and care for pheasants. The habits of pheasants.

References.—Pheasant Raising in the United States, H. Oldys. Farmers' Bulletin, No. 390, U. S. Dept. of Agriculture. Outdoor Work, Mary Rogers Miller. Pet Book, Comstock.

Geese.—November is the month when we see most often the wild geese in their flight southward; and this naturally turns our thoughts to these intelligent and interesting birds. A study of these birds and their habits may be made by observing domestic geese, using obs. 1–6, p. 141. The obs. 1, 2, 3 at the bottom of p. 142 and 4, 8 on p. 142 will prove inspiring subjects for short English themes. For supplementary reading, use "In Quest of Waptonk, the Wild" in Northern Trails by W. J. Long, and "The Homesickness of Kehonka" in Kindred of the Wild. Roberts.

Homes of the Carpenter Bees and Wasps.—When walking through the fields, it will surely add to our interest to do a little house hunting. These houses are the deserted nests of the little six-footed carpenters and may be found in almost any dead twig of sumac or bramble. If the partitions which divided the cells were made of mud, then the nest owner was a wasp; if it was formed of bits of the pith glued together, it was the nest of the little carpenter bee. For a lesson on these homes, use obs. 1, 2, p. 441. Obs. 4 and 5 suggest subjects for English themes.

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Editorial

Modern science is frankly materialistic. The scientist deals with things. He explains phenomena in terms of mechanics. A dynamo transforms a measurable quantity of mechanical motion into an equivalent of electricity. The wind blows, not "where it listeth" but because certain forces are working on the air to set it in motion; the direction and power of these air movements are determined by the combination of operating forces and are entirely predicable. Plant growth is a resultant of the many energies that act upon and within the organism. "Free as a bird" is an expression possibly justified by poetic license but not a scientific statement of fact for the bird's movements are all the certain consequence of the internal liberation of the energy of food materials and of the external forces such as wind, gravity, water waves. Even apparently distinctly "vital" phenomena are explicable in terms of physics and chemistry. Next to the production of life itself, the development of the egg is a crucial vital process. Yet the egg of the frog may be started on its career of development quite as well by proper chemical or mechanical stimuli as by the sperm from the male.

Science, that has succeeded in explaining so many things in terms of mechanics, is prone to believe that all phenomena are so to be explained. Even man is looked upon as a complicated machine whose actions are only the inevitable sequence of the forces that impinge upon him. A "soul" for man is quite as needless as some mysterious spirit for a clock, enabling it to perform its complex and purposeful movements in keeping time. Such is the view of many scientists.

"A primrose by a river's brim,
A yellow primrose was to him,
And it was nothing more."

Modern philosophy, on the other hand, is frankly idealistic and spiritual. I am more sure of myself than I am of things. In fact, things have no existence for me apart from myself. I know of them only as they are presented to me in terms of personal consciousness. Furthermore, I am aware of myself as a creator, as an independent force that accomplishes results, that are not merely the sum total of the physical forces applied but have beyond them a spiritual element. History and society are not explicable as the interplay of mechanical forces, but there is a further element, the creative personality of man that must be added to make them comprehensible. Then too, the universe that taxes the powers of human understanding to their limits and more must be the expression of intellect else my intelligence could find no thought in it, with which to busy itself.

"Haply God's riddle it, so vague and yet so certain,
The soul for it, and all the visible universe for it,
And heaven at last for it."

The difference of view point and of belief is no new difference. The contrast drawn above is an old cleavage of thought as ancient as philosophy. Each age has struggled anew with the problem; it will not be settled. Apparently it is impossible to demonstrate with the certainty of a mathematical proposition either that an Infinite Mind is back of all nature or that man himself is a soul rather than merely a perishable body. Such beliefs are still matters of faith.

Our faiths and attitudes to the world about us are largely forged in childhood. Whether children shall see in the rolling suns, the nodding flower, the blithe warble of the bird, merely an exhibition of chance mechanical complexities or whether they shall see the expressed personality of a kindly Creator will depend largely on the teachers' and parents' attitude of indifference or of reverence to the things of Nature, not as expressed in words, but as expressed in personal adjustment to the universe and in the manner of life that follows. The evaluation of life's opportunities and responsibilities is markedly influenced by the way we regard the material things about us.

Prize Pig a Practical Demonstration

How one teacher of sixty pupils in a one-room schoolhouse, situated in the forests of North Carolina, succeeded in getting her pupils interested in practical agriculture with a pig and less than an acre of uncultivated land, is told in a report of one of the field workers of the U. S. Department of Agriculture.

A farm paper offered a pure-bred pig as a prize for securing a certain number of subscriptions. This energetic school teacher set out among the parents of her pupils and succeeded in selling enough subscriptions to win the pig. When the pig arrived the pen was already built by the school children on the school grounds for its reception. The parents were invited and talks on pig raising were made. The rest of the day was spent in driving around to some of the best pig farms in the county where various kinds of live stock were scored and discussed.

The pupils learned that a pig could not thrive entirely on scraps from lunches and occasional ears of corn. An interested member of the school committee offered the use of his team and implements and the pupils started to work clearing the forest land to use as a forage pasture. They then planted crops of rye, wheat, rape, and grass to afford the pig grazing plots of green forage. A cold frame was also put in and cabbage plants were grown for sale, the money thus realized being turned over to buy whatever additional feed was needed to keep the pig.

As a result of the interest aroused, taxpayers and members of the school board have given their support to the establishment of a small demonstration farm. More land is to be purchased and the county agent is to visit the school each week. Since the pig was brought into the school less than a year ago, the membership of the county pig club has more than trebled.

Of Interest to Bird-lovers

The Massachusetts Fish & Game Protection Association, Room 748, Tremont Bldg., Boston, has issued a most interesting and instructive booklet on "*Conservation of our Wild Birds.*" It contains notes on nesting-boxes, bird baths, winter feeding, berry and seed bearing trees and shrubs, enemies of birds, etc. Every bird lover should have a copy. Price 50 cts. postpaid.

Book Reviews

Birds in their Relation to Man. By C. M. Weed and N. Dearborn. J. B. Lippincott Co., 1916. Second edition, revised.

Teachers will learn with pleasure that by a new edition this valuable work will continue to make it available to them. This was the first book to summarize the extensive results of American students showing the relation of birds to man and to put the results in a form readily accessible to the general public.

There are seven general chapters which discuss the following subjects: methods of studying the food of birds, the history of economic ornithology in America, the vegetable and animal food of birds, the amount of food consumed, birds as regulators of insect outbreaks, and the relation of birds to predaceous and parasitic insects. Thirteen chapters are devoted to the detailed consideration of birds by systematic groups. The four concluding chapters discuss the conservation of game and non-game birds, the prevention of injury by birds and the methods of attracting birds. The appendix contains a valuable chapter on the legal phases of bird protection, and a very valuable bibliography of the economic relations of birds. There are only a few changes from the earlier edition. The book should be in a large number of school libraries, particularly in schools where agriculture is emphasized, and in the city schools where the pupils need to learn the place of birds in man's economy.

CHAS. C. ADAMS.

Review on Senescence and Rejuvenscence. By Charles Manning Child. Pp. xi & 481, University of Chicago Press, University of Chicago. $4.00.

The book is a discussion of the indications and causes of old age and of the renewal of youth which may be accomplished experimentally in many of the animals. Chapter I is a discussion of the various theories of the organism. The author believes in a physico-chemical explanation of life phenomena. Chapter II discusses in general terms the life cycle of animals. Chapter III states the problem which he is attacking and gives the methods of investigation.

"The real problem before us is then that of finding a general basis for these phenomena which is applicable to all cases, not merely to those in which the organism manifestly grows old, reproduces, and dies, but also to those in

which, instead of dying, the whole organism breaks up or divides into new individuals, which repeat the cycle of growth, development, and reproduction and finally, to those cases in which the whole organism or parts of it appear to grow old, but live on indefinitely."

One can give in a brief review no notion of the bulk of the material with which the author has worked, or his methods of procedure. His final chapter is on the current theories of explanation of the phenomena which he is discussing. His own conclusion is that sensecence and rejuvenscence are both explicable in terms of metabolism. Few American zoölogists have put out a greater volume of experimental and observational work than has Dr. Child. Other zoölogists will welcome this collection of his major experiments and the discussion of their significance, regardless of whether he thinks the author's conclusions are justifiable or not.

The Adolescent Period. By Louis Starr. 211 p. P. Blakiston & Son Co. $1.00.

This book will be welcomed by the high school educator as well as parents who are concerned with children of adolescent age. The first chapter calls attention to the way in which growth occurs, its irregularity, and the conditions of all bodily organs, especially during the pubertal period. Chapter II is a very sane, simple chapter on physical education both for boys and girls. Chapter III discusses the more common disorders of adolescence; Chapter IV the faults and criminal tendencies, and the two other chapters discuss the sexual phases of adolescence.

The author states that of girls in the upper classes socially, from fifty to sixty per cent. are unhealthy to a greater or less degree. Of these 36 per cent. are anæmic; about the same proportion have constant headaches, and 10 per cent. have curvature of the spine. The percentage of illness for boys during this period is not as great, but is sufficient to make it manifest that few parents or teachers understand the adolescent period. The author's discussion of the whole problem is frank, simple and free from unnecessary scientific technicalities.

A Correction

I noticed a statement in the September edition of THE NATURE-STUDY REVIEW that I would like to have corrected. The statement was made in an article by Joseph B. Shine on "Elementary Science." I enjoyed the article very much, but I wish to ask for this correction. He made the following statement: "The teachers of Geography can use this experiment to explain why it is impossible for the housewives of higher Colorado to boil navy beans. You cannot boil potatoes or coffee in the Himalayas, because the boiling point of the water is considerably lower than 212 degrees F."

As a matter of fact, it is very easy to boil the beans or the coffee, but it is very difficult to cook them by boiling. This is the statement that he should have used. I have much trouble with my students and with other teachers in prohibiting the statement used by Mr. Shine and we ought not to let the statement pass uncorrected, because many teachers may use that incorrect statement.

E. A. STEWART,
Science Department, Gilbert, Minn.

A Correction

I have just finished reading the article on the Common Forms of Animal Life by Dr. R. W. Shufeldt in the March number of THE NATURE-STUDY REVIEW. In the interests of accuracy I wish to point out an error in this article which I believe should be corrected. I presume that the error is not Dr. Shufeldt's.

I am referring to the article on the Polyphemous moth, in which it is stated that the photograph is that of a female, and that the male has smaller and narrower antennæ than the female. The exact reverse of this is true, so that if the words male and female are reversed in the text, it will read correctly.

Very truly yours,

ARETAS A. SAUNDERS,
Y. M. C. A. Bldg., New Haven, Conn.

Annual Meeting and Election of Officers

This meeting will occur in New York, December 27, in connection with the meetings of the American Association for the Advancement of Science and other affiliated societies. President, five vice-presidents, five directors and the secretary-editor are to be elected. Nominations will appear in the December number. Some interesting papers will be presented. The afternoon program will include a symposium on testing the teaching of elementary science. Do not miss President Bailey's address. The address last year was worth going a long way to hear.

News and Notes

The following was the program of the 56th meeting of the American Nature-Study Society, St. Louis Section:

The 56th meeting of the St. Louis section of the American Nature-Study Society was held Saturday, Oct. 7, in the vicinity of Columbia, Ill.

At the annual meeting of the St. Louis Section of the American Nature-Study Society the following officers were elected: Director (2 yrs. from Sept., 1916)—B. G. Shackelford, Prin. Tremont School president, E. H. Christie, Prin. Hodgen School; secretary-treasurer, J. H. Drushel, Harris Teachers College; members executive committee, Mr. C. H. Sackett, Soldan High School, Miss Mary Andrew, Wyman School.

Note fossil Pittsburg Lake east of Conlogue, just below Cahokia. Dupo is a new and growing town. Why? Falling Springs is southeast of Conlogue.

The bluffs east of Dupo (Missippian limestone) are worthy of notice. The changing character of the bluffs from Dupo south should be seen. Can you account for the difference? Can you find the Indian mound on the bluff south of Dupo?

Just before reaching Columbia we pass through a region of young erosion in lœss. What evidence that this is young erosion?

Upon reaching Columbia the party will examine a good example of lœss. They will then walk to the quarry a short distance east of Columbia. Trilobites, archimedes, and other fossils may be found in this limestone. Look for granite, greenstone, quartz and quartzite pebbles in the creek gravel.

Lunch will be eaten at the quarry. At this time the members will be asked to decide the trip for Nov. 4. Cliff Cave, Creve Cœur, walk two miles beyond Chain of Rocks have been suggested. After lunch there will be opportunity to botanize and to gather bouquets of flowers and autumnal foliage.

Sugar Creek walk, October 21

Twenty-seven people attended the trip of September 23. The orchid of that trip is "greenish white nodding ladies tresses." The September number of THE NATURE-STUDY REVIEW if carefully read is worth a year's membership. See the paper on the copperhead snake also Bailey's paper on "When the Birds Nested."

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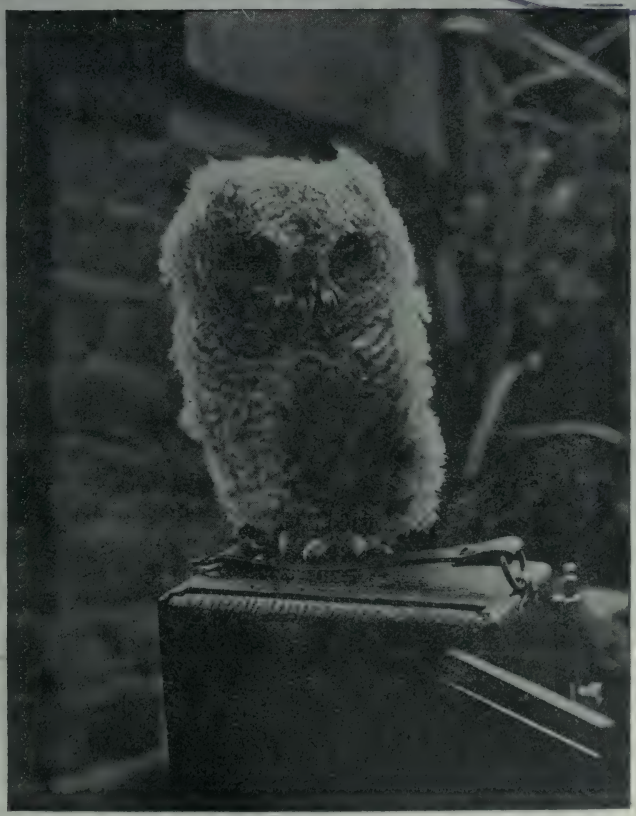

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THE
NATURE-STUDY REVIEW

VOL. 12 DECEMBER, 1916 No. 9

Midwinter

L. H. BAILEY

The November days are running hard into December. The nights are long; and the glow of my study light is like an island in the night, in the night that is dark and deep and heavy with winds and the driven leaves. The "dead of winter" comes on. The days will be narrowed to their smallest straits, and the darkness will dominate. Only a few drifting windy birds are in these days, only seldom is there a wild four-foot, the insects and the lesser world are tucked away so far and so compactly that they might never have been.

Soon will the jingle of bells give voice. The white-lights along every city street will gleam in all their glory. Every shop will be resplendent. The giddy whirl inside will go round and round. How expediently do we try to make up for the dead of winter!

Yet now is the world revealed. The mask is stript. The way it sleeps, the fashion of it,—this I want to know. How the tree looks in its dormancy, where are the cocoons, how the frost comes to the creek, where the rosettes of many weeds hug the ground and how the vegetation shrinks into the cold, the way of the blowing winds, how the snow comes down,—these I want to know. One world from December unto December, with its wonderful shifts, one nature preparing and rising and sleeping and then preparing again forever and forever: this is the great joy of it,—not the waiting for a new season, but the wonder-panorama of the present! This is Jackman's "rolling year."

To be a part of it, to expand in the blessed uncovered days of winter, to feel the leap of spring (what means this word "spring"), to burn with the summer, to ripen with the autumn, and then again to go down into the wild winter: verily, this is ilfe!

Some of the Plants Mentioned in Shakespeare

ADELINE F. SCHIVELY

It may be rather late in this year, so full of Shakespearian celebrations and investigations to present this article to the readers of THE NATURE-STUDY REVIEW; but it is hoped that it still may be of use to some. Certain occurrences combined to give the author an interest in the subject. A fascinating catalogue, issued by Knight and Struck, Seedsmen of New York, was received in the early spring. This firm, in anticipation of the possible needs of this tercentenary year, had arranged a rather full list and provided for supplying seeds and also in some cases the roots of the plants. Selection of what might be best used in our School Garden and preparation for talks with the Normal School students and children of the Practice School stimulated investigation. The more one searched,, the more, interested one became. The choice of plants was determined mainly by these thoughts; unusual or unfamiliar ones; fanmiliar ones; those interesting mainly from folk-lore standpoint.

We must remember that from time immemorial the English have been flower lovers, and their wonderful and beautiful gardens have been again and again described by travelers and writers. It is true also that the climate assists the labors of the gardener, and rich and poor all aspire to possess a garden of some sort. In a book—"Shakespeare's Garden"—J. Harvey Bloom, I found such an excellent description, that I shall quote it here. It will serve for an introduction to the topic to be discussed.

"The general arrangement of a house of the size of Shakespeare's would be similar to that so carefully described in the Maison Rusbique or Countrie Farme of Charles Stevens and John Leebault, Doctors of Physicke, London 1600. So exactly does this volume describe the manner of forming such a garden as Shakespeare's father may have had on Henley Street, or the poet himself at New Place that we may be forgiven for reproducing it in its entirety. After describing the garden for vegetables he proceeds—'The Garden of Pleasure shall be set about and compassed in with arbours made of jesamin, rose-marie, juniper, cypress trees, savin, cedars, rose-trees, and other dainties first planted and pruned according as the nature of every one doth require, but afterward brought into some forme and order with willow or

juniper poles, such as may serve for the making of arbours. The waves and alleys must be covered and sewen with fine sand well bet, or with powder of the sawing of marble, or else paved handsomely with good pit stone.

This garden by means of a large path of the breadth of sixe feet, shall be divided into two equal parts; the one shall contain the herbes and flowers used to make nosegaies and garlands of, as March violets, Provence gillo-flowers, purple gilloflowers, Indian gilloflowers, small paunces, daisies, yellow and white gilloflowers, marigolds, lily conually, daffodils, canterburie bels, purple velvet flowers, anemones, corne flag, mugwort lilies, and other such like, and it may be called the nosegaie garden.

The other part shall have all other sweet smelling herbes, whether they be suche as beare no flowers, or if they beare any yet they are not put in nosegaies alone but the whole herbe be with them, as Southern wood, wormwood, pelliborie, rosemarie, jesamin, marierom, balm mints, peniroyall, costmarie, hyssop, lavender, basil, sage, savories, rue, tansey, thyme, cammomill, mugwort, bastard, marierin, nept, sweet balme, all good, anis, horehound, and others such like and this may be called the garden for the herbes of good smell'."

Such may we picture Shakespeare's Garden to have been. Here he often sat, pondering and composing. We may feel certain, too, that he frequently wandered in the woods and meadows near by, where he was well acquainted with plant life.

Let us now turn attention to certain special flowering plants; both wild and cultivated are represented.

Columbine or dove plant has a curiously formed flower. It is a member of the same order as buttercup—the Ranunculaceae; yet the floral parts are so irregular that an uninformed person would never suspect the relationship. It is a native of many parts of Europe and Asia, and America, and has become a garden favorite, and doubtless was in the Elizabethian days. It is mentioned in Hamlet, IV–V–180, when Ophelia says:

"There's fennel for you and columbines."

Marigold—A strong scented plant whose bright yellow flowers of varying shades, render it a popular garden plant; it is also a continuous bloomer and perhaps this it additional reason for its selection. In Winter's Tale, IV, 4, 105, we read:

"The marigold that goes to bed with the sun
And with him rises weeping."

In Cymbeline II–3–25:

"And winking Mary buds begin
To ope their golden eyes."

We must grant that Shakespeare was a close observer of the habits of this flower: In one of the sonnets (25) he writes:

"Great princes' favorites their fair leaves spread.
But as the marigolds at the sun's eye."

It is probable that the plant mentioned was that known to us as Calendula, whose common name is soup or pot marigold. Indeed there is a wild flower—the marsh marigold (not a member of Compositae) which is stated by some writers to be the one to which the poet refers.

The Marigold

But not alone for beauty and brightness was the marigold valued. Did the penetrating odor suggest that there might be medicinal properties? Just how the notion arose, it is difficult to say, but the juice extracted from the flowers, doubtless by boiling, was used to wash the mouth of a person suffering from the toothache, and this was stated to be an efficacious remedy. Knowing this the thrifty housewife was careful to include a goodly quantity of dried flower heads among her precious winter stores.

Pansy.—Perhaps no flower has been a more general favorite than this. A great variety of popular names exist not only in English, but also in French and German: Yet our readers must not have in mind the large flower, whose marvelous hues, and curious variegations excite admiration today. It is the small flower (*Viola tricolor*) a relative of the violet, known to many best by its name Johnny-jump-up. This grows wild in many parts of Europe and is sometimes yellow, sometimes purple. Indeed, this flower under the skilful cultivation of the gardener has yielded us the giant types, the orchid flowered, etc. Shakespeare mentions

it by the names of love in idleness, Cupid's flower, heart's ease is suggested in Hamlet—IV—5—176—Ophelia says:

"There's pansies—that's for thoughts."

Viola Tricolor

Love-in-idleness is commonly used in Warwickshire today. Cupid's flower is a name which is said to be peculiar to Shakespeare. In the Taming of the Shrew, we find:

"But see, while idly, I stood looking on
I found the effect of love-in-idleness."
—*I—1—155.*

Midsummer Night's Dream yields seven references:

"Flower of this purple dye.
Hit with Cupid's archery."—*III—2—102.*

"Dian's bud o'er Cupid's flower.
Hath such force and blessed power."
—*IV—3—75.*

"It fell upon a little western flower,
Before milk white, now purple with love's wound,
And maidens call it love-in-idleness.
—*II—1—166.*

Cowslip

Primrose—cowslip—oxlip.

Statements made by various authors seem to indicate that all three of these are natives of England. They are members of the order Primulaceae. These flowers hybridize very readily and natural crosses are very common.

The primrose (*Primula acaulis* Linn.) blooms in April and is referred to in the following quotation from Two Noble Kinsman:

"Primrose, first child of Ver:
Merry spring-time's harbinger.
With her bells dim."

The German name for this flower is Schüssel Blumen—the key flower,—evidently also emphasizing the thought of its being the earliest spring flower.

In The Winter's Tale IV—4—122, we read:

"Pale primroses
That die unmarried ere they can behold
Bright Phoebus in his strength."

Again,

"Thou shalt not lack
The flower that's like thy face, pale primrose."
—*Cymbeline IV—2—120.*

And

"Where you and I
Upon faint primrose beds were wont to lie."
Midsummer Nights Dream 1—1—214.

The *cowslip* blooms in latter part of April and continues in May. It is Primula veris (Linn). No satisfactory explanation of the origin of the common name has been given. The flowers grow in profusion in the meadows and are much beloved today by the English people, as doubtless they were in Shakespeare's day. We find these careful descriptions:

Oxlip

"The freckled cowslip."—*Herny V. 2—49.*
"Cinque-spotted, like the crimson drops.
I' the bottom of a cowslip."
Cymbeline II—2—37.

"The cowslips tall her pensioners be;
In their gold coats spots you see;
These be rubies, fairy favours."
Midsummer Nights Dream II—1—10.

The *oxlip—Primula elatior*—bears large primrose-like flowers on a central stalk. The derivation of its name, too, seems uncertain. Shakespeare refers to the flower in the following:

"Bold oxlips and crown imperial."
The Winter's Tale IV—4—125.

"I know a bank whereon the wild thyme blows,
Where oxlips and the nodding violet grows."
Midsummer Nights Dream II—1—249.

Let us next consider a familiar quotation from Hamlet:

"Then with fantastic garlands did she come.
Of crow-flowers, nettles, daisies, and long purples."
Hamlet—IV—7—169.

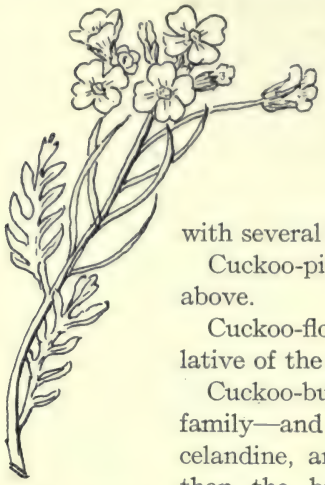
We wonder just what flowers Ophelia gathered. We may suppose that she had been in a meadow, for all of these mentioned might have been found growing there. *Crow flowers* are probably

Long Purple

Daisy

a variety of buttercup, but not exactly that which is so familiar to us. *Nettles*, might she have plucked because she was not in her right mind, some branches of this weed with its stinging hairs? Perhaps, but some authors state that there are plants bearing white flowers, and known as the dead nettle—a member of the Labiatae—which she might have found. *Daisies* are probably similar to our own. But *long purples* puzzles us. Commentators do not seem to be of the same opinion. Unfortunately the name "long purples" may popularly refer to two entirely different plants. One is an arum—a relative of Jack-in-the-pulpit—which is also called the cuckoo-pint. The other, an orchid

of rich purple hue, whose roots are branched, palmately and whose curious form has received the name of dead men's fingers. This fact is mentioned in lines following the selection which is quoted.



Lady's Smock
or
Cuckoo Flower

—V—2—906.

The advent of the cuckoo was an event which filled the English people with delight and we find the name of this bird associated with several flowers.

Cuckoo-pint—the arum mentioned in the lines above.

Cuckoo-flower is a popular name for a relative of the wild geranium or crane's bill.

Cuckoo-buds are members of the buttercup family—and are also known as the starry celandine, and the king cups. They are larger than the buttercup, and resemble the marsh marigold. A reference to these is found in the following quotation from Love's Labor Lost

"When daisies pied and violets blue.
And lady smocks all silver white,
And cuckoo buds of yellow hue
Do paint the meadows with delight."

We pause to inquire—what are lady smocks? This is a popular name for a member of Cruciferae—known as Cardamine pratense. The flower is white and delicate, and is one of those flowers named for the Virgin Mary. In Warwickshire the local name is "smell smock."

Primrose

Now let us visit the herb garden and discuss some that we certainly would have found growing at that period. As we glance around, we are impressed with the fact that so many belong to the Lahotae Mint Family. Think of several—then try to recall their odors. How very

different are mint, sage, lavender, thyme! These plants are provided with glandular hairs, whose function is to elaborate certain essential oils and yet there is a remarkable variety in the products.

Rosemary

We turn for a moment to another group—the Umbelliferae. Here are fennel, anise, parsley, caraway.

Some of these are useful for culinary purposes; some have medicinal properties.

Rosemary. This plant is a native of Southern Europe and grows along the sea-shore. It is of evergreen habit. It derives its name from Latin ros maris, since it flourishes where the sea-spray falls on it. It bears a rather pale bluish flower—the whole plant is very fragrant. A small portion of the plant will retain its fragrance for a long time, after it is gathered. It is sacred to friendship. More says: a sprig of it "speaks a dumb language." It was commonly used at weddings and also funerals. Many medicinal virtues were ascribed to it. Not the least being its power as a decoction to help the brain—mainly by strengthening the memory. It was said to be of value in treating heart disease, also a specific against cramps.

"Rosemary and rue, these keep.
Seeming and savour all the winter long;
Grace and remembrance to you both."
The Winter's Tale—IV—4—74.

"There's rosemary, that's for remembrance."
Hamlet—IV—5—175.

"Stick your rosemary on this fair corse.'
Romeo and Juliet IV—'5—79.

Thyme

Thyme—a sweet scented herb growing wild in great profusion is referred to in the familiar words:

"I know a bank whereon the wild thyme blows."

Lavender—not a native plant—but well known to many of the English gardeners. The name is derived from an old Latin word—

lavendula, to wash. Small sprigs of the plant were used to scent freshly laundered clothes. The flowers are purplish blue and these seem more fragrant than the rest of the plant: Once only does Shakespeare mention it.

Lavender

"Here's flowers for you;
Hot lavender, mints, savory, marjoram."
The Winter's Tale—IV—4—104.

Sweet marjoram now appropriately follows. Truly this was a valuable herb which the mistress laid away. It was a remedy for colds in the head. Placid to the nostrils it provoked sneezing and, perhaps thus the cold in the head was relieved. It also cured the toothache, if the sufferer chewed it well. The leaves dried and mingled with honey formed a sort of plaster which was placed on bruises, and the clotted blood was quickly dissolved.

Sweet Marjoram

Saffron. The plant (Croens sabivas) was frequently cultivated in England in Shakespeare time. It is not known when first introduced. It yielded a yellow dye which was used often in the dairy and kitchen; but also in the preparation of an ink or sort of paint of deep yellow hue used by those illuminating parchments, books, etc. Some authors state that a native plant Colchicum autumnale. The word saffron is derived from the Arabic; the plant might have been brought to England during the Roman period. It was believed to possess certain medicinal properties,—it was somewhat of a stimulant as it was said to make the senses quick, and to cause a man to shake off drowsiness and become merry. Shakespeare mentions it only as a color:

Saffron

"Who with thy saffron wings upon my flowers,
Diffuseth honey-drops, refreshing showers."
Tempest IV—1—78.

"I must have saffron to color the warden pies."
The Winter's Tale. IV—3—48.

Rue—a plant not native to England, probably introduced from the Continent. It has beautiful, glaucous foliage, but possesses a bad, penetrating odor. It is a member of the Rutaceae; the ailanthus tree, well-known to us, also is classed here. This tree also has a rank smell.

Rue

On account of this property, rue was planted in gardens as a protection from the inroads of snakes and toads; for it was said to be efficacious in keeping away these animals from devouring certain plants, especially sage, of which they were very fond. It would also serve as an antidote when one was bitten by a venomous beast. Then, too, it was said to quicken one's powers of vision. In some manner the plant became associated with the thought of sorrow or repentance. When Ophelia says to the Queen:

"There's rue for you; and here's some for me; we may call it herb-grace o' Sundays: O you must wear your rue with a difference."

She probably refers to this thought, indicating that sorrow was in her heart; but repentance should be in the queen's. But—"herb-grace." Folk-lore assists us somewhat. A popular notion at one time was known as the doctrine of signatures. This is frequently associated with plants and their medicinal properties. Should the leaves on the root show a shape resembling some organ, immediately the finder would say, for example, here is a leaf shaped like the liver, hence here is a natural remedy for the treatment of any disease or derangement of that organ. Perhaps in regard to rue, the people argued in somewhat a similar manner. Here is a plant of very bad odor; such a one must belong to witches or evil spirits. So a person considered bewitched or possessed of an evil spirit received the following treatment. He was taken to church on a Sunday, and in a special part of the service, the priest waved the plant over the person, or sprinkled him with water in which rue had been steeped, at the same time using prayers. Hence "herb-grace o' Sundays." This expression occurs five times in Shakespeare's plays.

Mosquito Extermination in New York

By Gayne T. K. Norton

New York City's Health Commissioner, Dr. Haven Emerson, took enough time off from work on the infantile paralysis plague to show a party of civic workers, tax-payers and newspaper men what he has been doing to the Jamaica Bay mosquitoes—to vindicate himself, and to prove that public money was not being wasted. The trip took a whole afternoon; the course lay through miles of salt marsh. Not one in the party of one hundred was bitten once.

The city appropriated $150,000 for drainage work; of this sum $60,000 is being expended in the low-land along Jamaica Bay and the remainder along Flushing Bay. There are ten power ditching machines at work, cutting ditches through the marsh connecting with Jamaica Bay. In this way the entire marsh is being drained; and the rising and falling tide in the bay prevents the water in the ditches from becoming stagnant. The machines were invented by H. I. Eaton, who is directing their operation. There are 8,000 acres of marsh that are being ditched at the rate of 30,000 linear feet a day; 1,790,000 feet of ditches having thus far been dug. These, following soil surveys and surveyor's lines, criss-cross the whole marsh, seaming it until the surface resembles a miniature "western front." Some are of great length and the main ditches rival small rivers in size.

The entire neighborhood is now a "wonder spot" for those who enjoy the exploration of a salt marsh. All one's time can be devoted to flowers, mosses, insects, snakes, or birds, as the case may be, without the annoyance of fighting mosquitoes.

Anti-mosquito work began in New York in 1907 with Health Department experiments on Staten Island. Since, 23,000 acres of marsh have been drained at a cost of $757,863. With the close of this summer the work will practically be completed. There remains about 9,000 acres of salt marsh and 1,100 acres of fresh marsh to be ditched; this, it is hoped, will be done by frost.

Many Long Island towns have taken the hint from New York. Islip, with three square miles of salt marsh, has ditched 500 acres. Mamaroneck and New Rochelle are actively at work spending thousands in ditches.

New Jersey marshes are also receiving attention; the Newark and Hackensack meadows are being treated in much the same

manner as are the New York marshes. The New Jersey Mosquito Extermination Commission is testing a Texas plan—the use of bats to rid the cities and towns of the pest.

In San Antonio, Texas, a municipal bat roost is maintained which shelters about 250,000 bats; it cost about $1,500 to erect and maintain. Each bat, it is claimed, has a nightly capacity of 250 mosquitoes. But this method, it would seem, remedies the effect and not the cause.

The mosquitoes, Family CULICIDAE, do not form a large insect group, but are an important one. They are a pest, and carry disease. They range from the tropics to Alaska, Lapland and Greenland. They are true air-breathers but are born in stagnant water. They breed rapidly and pass through several generations a year; the adults hibernating in out-houses, cellars and cold garrets. The main purpose of the adult seems to be propagation of the species; its life seems to be dependent only upon this opportunity. Females are normally plant-feeders, their mouth-parts very different from the flesh-sucking males.

Five genera are represented in this country: Anopheles, Aedes, Megarhinus, Psorophora and Culex. Most of our species belong to the genus Culex. Those of the genus Anopheles carry malaria. Those of the genus Aedes are very small; those of Megarhinus and Psorophora are large—known as gallinippers.

Mosquitoes seldom fly far. Anopheles, of which, in the United States, we have three species, appear to be of extremely short flight, while Culex seldom leave their breeding places. Three methods of extermination are used: drainage, use of kerosene on surface of breeding waters, and the introduction of fish into fishless ponds.

Eggs, numbering from 200 to 400, are laid in a raft-like mass, gray-brown from above and silvery white from below. Laid in the early morning the eggs will hatch, on a warm day, by two in the afternoon. The wigglers are very active, breathing at the surface, descending for food. The wiggler molts three times reaches maturity and transforms to a pupa in a minimum of seven days, in hot weather; in cool weather this takes much longer. The pupa stage lasts two days, longer in cooler weather, when the skin splits and the adult mosquito emerges.

The Oriole

Annie E. Ash

Te-de, te-te-te-te-te-did, O dear little bird, you tried to fly too soon! But you must not stay here, a few moments ago Tabby was looking around for a choice morsel like yourself; the little bunch of downy life is gently lifted from the ground and carried into the house. After some bread and milk has been dropped into the wide open mouth, Tee Dee is placed in a cage and turning her bill over her wing takes a nap. Miss Mary is known the neighborhood around as a "bird friend" and she suspects that an anxious mother bird is not far off; she knows too what will likely happen if she hangs the cage with the door open in the lilac tree near the porch, nor is she surprised when Mrs. Oriole does come in a short time and sits on the limb near her

nestling. She even enters the cage and hovering over her birdling, coaxes with a loving mother note "te-de-de," she pleads, "te-de-de-did-did," she insists, but Tee Dee, remembering her plight of the morning, will not risk another fall "te-de-de-did-didn't" and at length completely discouraged the mother flies away.

She is content in her new home and swings in her cage; many birds sing in the trees which grow in the big yard and she chirps cheerily to them; here comes robin from the rose hedge, a visitor,

'Churr, cheerily, cheer'
Where did you come from dear?
From a nest of string and down and reed,
'Te-de, did-did-did,' indeed.

A blue-bird chances to fly by,
'Du-o, beauty, who-o, who-o'.

The oriole gives back reply,
'Te-de, pit-uo-o, two-o'.

The vireo above them all sings:
'Now-here, where, a-wha-ae?'
I wanted much to try my wings,
The tree was tall and I had a fall, that's all,
Te-de, pet-o, pet-oo-a.

You are welcome to become a member of the family, but do let Miss Mary know more about yourself; what few feathers you have are on your wings, so you cannot be over two weeks old, and that crown of down that you wear on your head places you in a high order of birds, and besides, gives you a look of importance far beyond your weeks, your soft grey down dress is very becoming too. I see from the color of your feet and legs that you belong to the "true blue stocking" tribe.

How she does eat and sleep and grow! A loud, "te-de, peto," Tee Dee wants her breakfast, awakens the household early in the morning. During the first week food is dropped into her mouth by hand and afterward a feeding-stick is used until she is able to feed herself, she lives chiefly on bread soaked in milk and raw minced meat. To see her open her bill at the mere sight of food leaves no doubt in the mind that her first purpose in life is to eat; if the slice of bread is as large as the side of her cage or the apple bigger and rounder than her whole body, what of that! Her perch is grasped only the more firmly and her mouth opened the wider as if to say, "I am willing." The way she fills her crop is astonishing! On several occasions she imposed on that organ such an

amount of eatables, as to quite lose her poise and come to the floor of the cage in a very abrupt manner. Can she be a water-bird that she bathes so often! and what bird is there that takes better care of her plumage than Tee-Dee.

She is allowed to fly about the house an hour or two every day, she flies well long before she feeds herself. Nothing escapes the glance of her sharp eye or the test of her skillful beak; you have no need of pins, needles or buttons, little one, they must be hid away, and your messages are far sweeter sung than written, so the pen and ink must be put aside too. O, yes, you may play house with those bright colored strings, if you wish, you have pulled them apart, now see if you can weave them together, there is no doubt but that you will contrive a real home of your own some day. You have scattered the calling-cards about in every direction, please return them to their holder. When play-time is ended she is not always ready to return to the cage and gives the Friend a lively chase, she flits here and goes there, now she stops a moment on the back of the chair! She is almost in hand, there she flies to the top of the chandelier! See her balance herself over that boquet of white lilies on the mantel! Now she stays a minute on the top of that picture and at length comes to rest on the top of the mirror near the ceiling! Miss Mary tired out sits down to rest, the truant knows that the play is over and, being ready for a lunch, allows herself to become a captive.

At the sound of the Victrola and the piano she becomes quiet and listens with rapt attention till the strains of music cease. Her calls are tuneful and she bids fair to become a contralto singer of considerable note. She taps the brass ornaments of the chandelier with her bill and enjoys the tinkle. The children call it Tee Dee's piano, and she never fails to perform on it every day.

She pipes back answer to her feathered neighbors in their own strains, they look! they listen! "What bird may this be that knows all of our songs and presumes to sing them too!" As for her own daily needs but few call-notes are necessary, what with a poise of the head to one side, a flirt of the tail up and down and a series of inflections and modulations of her voice no doubt is left in the mind as to what she wants.

Yes, she is an artist, no doubt of that, for did not Miss Mary come into the sitting-room one day just as Tee Dee was hopping up and down on the colored pictures which covered the sides of a

newspaper! and after she had finished that exercise she pecked holes in the brightest spots. Along with all her other accomplishments is a keen sense of color.

Did anyone ever hear of a bird having manners! A playful tug at the sleeve or an alighting on the hand or foot is her way of giving thanks.

Observe her eat a piece of bread. She first thrusts her bill into it, and then by forcing it open breaks the bread into bits; with her lance-like tongue she draws the crumbs into her mouth. Here comes along Mr. Grasshopper, quick as a flash he is seized and held a victim with those sharp, curved claws, in a moment all that is left of him are the hard parts of the heads and legs.

Do you wonder how she will ever be able to form a nest like the one we saw yesterday hanging from the elm twig in the grove? If you do, examine her set of tools and consider her intelligence.

Five weeks have passed by since Tee Dee came to live with us and she is no longer a birdlet in down dress but has changed that for one of green and gold feathers and she is almost as large as her mother; she can feed herself also, why not free her? It takes but a moment to open the cage door and she flies about the yard searching for insects; that old apple tree attracts her attention and she stays there awhile, but she tires and takes a long sun-bath on top of the arbor. She becomes hungry and comes to the door begging for food, then away she flies and soon is on the ground. There is Tabby, "Tee Dee," Miss Mary calls; "tweet" answers the little bird and flies to the porch and is saved. It is plain to be seen that she is not yet old enough to take care of herself and she spends another fortnight with her friend.

September is almost here, the lanes are decorated with asters and golden-rod ready for her approach and a cricket which belongs to her orchestra spent the hours of last night tuning up his pipes and cold winds have driven the birds silent to sheltered nooks; yes, it is time for Tee Dee to go.

Early in the morning she is carried to a fine old pasture a mile from the house and again set free; she flies into a cluster of bushes and is lost to view. What bird would not be pleased with such a bower! Good-bye, dear little one, may you enjoy your short life! O yes, Tee Dee is sadly missed, but it is best that she should live out of doors. Late in the afternoon, Miss Mary walks in the direction of the pasture but before she reaches it

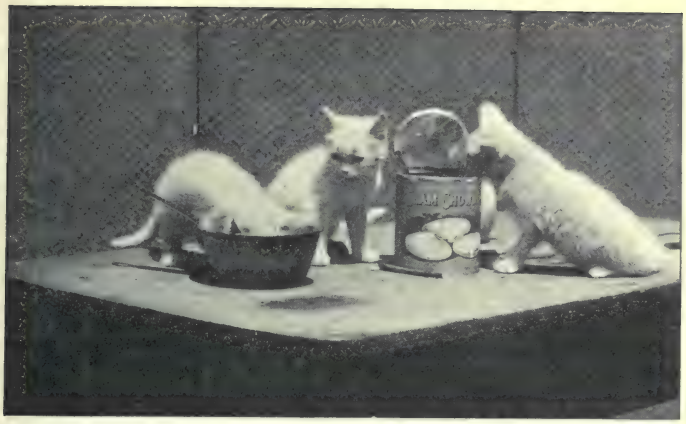
the well known call, "Kruuk-kruuk," Friend Friend, is heard from the highest point of a great pine tree, she wings her way across the road and flutters around Miss Mary in a transport of joy. She is once more in hand, what is to be done! It takes but a moment to decide; she is carried back to the cage in the lilac-tree, and the door is left open, she eats some bread and milk, takes a bath, then away she flies into the garden! Some days she is so busy in the fields and orchards she almost forgets to return, but one may see her coming back every evening to her supper and to the maple-tree in front of the Friend's door, where she spends the night. "Kruuk, te-de, tweet," she calls from the shrubbery near the house, Friend, let Tee Dee come in. "No, Tee Dee must live out of doors and be a wild bird," is the reply.

Occasionally she has a bird party and treats her guests to crumbs; the blue-bird and the wren, the chick-a-dee and the nut-hatch are sure to be there; once Mrs. Vireo came and brought her four little ones.

There comes a day when Tee Dee returns oftener than usual, she eats as she never ate before, each feather is oiled and laid in place, she lingers long at the cage door looking around as if undecided, but at length flies to her tree, in the morning she is nowhere to be seen nor can any other oriole be found.

Sweet bird! In all flower-land to which you have gone, there will be no rarer gem than your own beautiful self. Next May, when Spring has trimmed your tree with tender green come back and bring your mate with you, sit on its bough and sing to us the story of your wandering during your long absence.

Almost a year has passed and it is ten o'clock in the morning, Miss Mary is writing at her desk, she hears the twitter of a bird and looks toward the snow-berry bush. What does she see? Can that be Tee Dee feeding her baby oriole? Several persons who knew Tee Dee and are interested in bird life are called to witness. "Certainly it is she for what other bird would come to that same bush and that same tree, she is not the lea t bit afraid," they say. What a diligent mother! At short intervals she returns to feed the downy one, it remains on that same twig all of the morning and then moves into a maple bough that overhangs the bush, there it stays until the sun goes down and in the after-glow the mother leads her to the old time resting place and hides her under the leaves.



The Domestic Cat

Bird Killer, Mouser and Destroyer of Wild Life,
Means of Utilizing and Controlling it.

EDITOR'S NOTE:—Mr. Edward Howe Forbush, State Ornithologist of Massachusetts, recently issued a Bulletin of The State Board of Agriculture under the above title. The Editor asked Mr. Forbush to furnish an article for THE REVIEW on the subject of the cat and was given permission to utilize excerpts from the bulletin so as to save Mr. Forbush unnecessary expenditure of additional time.

Number of Cats.—"In setting forth the effect of the feeding habits of the cat, it is essential first to give the reading public an adequate idea of the numbers and prevalence of cats, not only throughout cities, towns and villages of New England, but on farms and in forests as well, as no one who has not investigated the subject has any idea of their ubiquity. Hundreds roam about the country towns. On the early snows of winter their tracks may be found on nearly every farm in the land. There is no forest or woodland so remote that the cats have not penetrated. In 1912 I visited the Maine woods in December, and there, in the snow, miles from any human dwelling, were more tracks of cats than of any other creature."

Great Numbers of Vagrant Cats in Cities.—"It is a well-known fact that cities are overrun by vagrant cats, many of them hungry and cold in winter, finding a precarious living by catching mice and rats and visiting "dumps" and garbage cans. Many are fleabitten, mangy and diseased, and the suffering among them must be great. All such cats should be executed, as a measure of humanity and public safety. Humane societies have undertaken this task in Boston, New York and other cities. The

Animal Rescue League of Boston has done a great work in rescuing numbers of homeless, starving cats and humanely destroying them, also in disposing of surplus kittens. Mr. Huntington Smith, managing director of the league, has been kind enough to give me the following account of the cats handled by the association during ten years, and the disposition made of them:

YEAR	Received	Destroyed	Placed in Homes
1905	14,400	13,791	649
1906	16,151	15,667	494
1907	14,157	13,710	447
1908	15,330	14,915	313
1909	20,414	20,042	372
1910	23,089	22,385	310
1911	23,691	22,529	229
1912	27,670	27,295	356
1913	29,525	29,078	447
1914	31,122	30,688	536
Aggregates, ten years, 1905–14	215,449	210,090	2,908

Numbers of Vagabond or Wild House Cats in the Country.—"Wild or feral house cats that pass their lives mainly in the fields or woods are rarely seen by human eyes, except by those of the hunter or naturalist. Therefore many people who have never investigated the matter, and never have seen such cats, find it hard to believe that they are numerous enough to be a great menace to wild life, but nearly all my most observant correspondents who roam the woods and fields report traces of many cats. Mr. William Brewster of Cambridge, the Nestor of New England ornithologists, says that he and his dogs frequently have started cats from their resting places in woods and game covers. He says, writing from Concord, that they are seldom noticed, being shy, elusive and largely nocturnal, but that he finds their tracks everywhere in the woods after the first snowfall. He asserts that his guides, James Bernier and William Sargen, of Upton, Me., trappers of large experience, assured him some years ago that the forested parts of New England with which they were familiar were numerously inhabited by wood cats. Quite as many cats as other fur-bearing animals were caught in traps even in "locations upward of thirty miles from any house or clearing, and over the northern Maine line in the Canadian woods."

"Mrs. Mabel Osgood Wright, Fairfield, Conn., president of the Connecticut Audubon Society, writes that in seven months, twenty-eight cats have been shot on her twenty acres, although the six nearest neighbors keep none. Mr. George C. Donaldson of Hamilton, member of the bird committee of the Massachusetts State Grange, avers that there are many cat tracks in the woods in that region. Hundreds of similar assertions might be printed, would space allow, but a few abbreviated statements follow:

"Hardly a day passes that I do not see one or more," Nathan W. Pratt, North Middleborough. "Saw at least twenty around a heronry, and judging from the tracks after a night's rain there must have been several times that number," Dr. C. L. Jones, Falmouth. "Have seen a great many cats in the woods and about abandoned farms and farm buildings that had not been occupied in many years, and far from any occupied building," C. Harry Morse, Belmont. "See many when shooting," Walter P. Henderson, Dover. "Have run across many in woods. Last year, killed three in one day far from any house," Samuel Hoar, Concord. "Legions of abandoned, vagrant, or wild cats," Bernard A. Bailey, M.D., Wiscasset, Me. "About one-half the tracks in the woods are cat's tracks," J. K. Jensen, Westwood.

Cats Unfed by Owners.—"Many cats, never fed or half fed by their owners, forced to range in search of food, roam far at night. Mr. N. A. Nutt of South Ashburnham, whose work takes him out during the latter half of the night, has seen cats coming from a patch of woods on their way back to the village, across the railroad track, so wet with dew as to appear as if they had been plunged into water. Countless village cats, farm, stray and feral cats extend the rapacious influence of the species throughout the land. Dr. Frank M. Chapmann of the American Museum of Natural History, New York City, believes that there are not less than 25,000,000 cats in the United States, and that there may be twice that number.

The Cat a Birdcatcher in Modern Times.—"In every land, in every tongue, the cat has been noted as a slayer of birds. Maister Salmon, who published 'The Compleat English Physician' in 1690, describes the cat as the mortal enemy of the rat, mouse 'and every sort of bird which it seizes as its prey.' The French and Germans, particularly, have deplored the destruction of birds by cats. M. Xavier Raspail, in an article on the protection of

useful birds, written in 1894, says that though cats are outside the law, and therefore may be killed with impunity, their numbers are renewed from the villages incessantly to such an extent that not a night passes without traces of these 'abominable marauders.' Of 67 bird's nests observed from April to August, only 26 prospered; at least 15 certainly were destroyed by cats, and others may have been. Baron Hans von Berlepsch, the first German authority on the protection of birds, after forty years' experience says that where birds are to be protected the domestic cat must not be allowed at large.

Number of Birds Killed by Cats.—"Most people do not realize how destructive cats are to bird life because their attention has never been called to the facts and because most feline depredations occur at night. In my investigations much evidence has been secured which is very convincing. In the year 1903, at the instance of the secretary of the state Board of Agriculture, an inquiry was undertaken regarding the decrease of birds in Massachusetts. As a part of this investigation a questionnaire was sent out to some 400 correspondents, which was filled out and returned by more than 200. In response to a question regarding the effect produced on birds by their natural enemies, 82 correspondents reported cats as very destructive to birds. This was a much larger number than those reporting any other natural enemy as destructive. Nearly all who reported on the natural enemies of birds placed the cat first among destructive animals. These reports and opinions attracted my attention and I began to inquire regarding the number of birds killed by cats. The more the matter was investigated the more shocking it became.

Bird Slaughter by Cats.—"Dr. Anne E. Perkins of Gowanda, N. Y., who has had a long experience with pets, tells of a cat which brought in meadowlarks, an oven-bird, two hummingbirds, and a flicker within a few days. She writes, "I am skeptical when any one says 'my cat never catches birds; it is only the hungry ones abandoned by their owners.' I have seen an active mother cat in one season devour the contents of almost every robin's nest in an orchard, even when tar, chicken wire and other preventatives were placed on the trunks of the trees. The robin builds so conspicuous and accessible a nest, and is so easily agitated by the approach of the cat, that it is difficult to save the young." She writes me that for years she has known of innumer-

able nests being robbed, those of robins, catbirds, song sparrows and wood thrushes especially, and she believes that the harm that cats do can hardly be oversetimated. The young in the nests or just out most often fall a prey, but the cats caught many adult barn swallows, and caught snipe, grouse, hummingbirds, meadowlarks, and many unidentified small birds. Many a time at 4 A. M. she has gone to the rescue of birds attacked by night-prowling cats.

"Mrs. Elizabeth B. Davenport of Brattleboro, Vt., well known as an accurate observer, who has taken great pains to teach cats not to kill birds, writes that her experience covers many years while feeding birds about her grounds, and seasons spent on farms in Connecticut and in Vermont. In her grounds every small bird was attacked if cats had access to feeding places, and she had to surround these places with wire netting in summer and to protect them with high snow walls in winter. On the farm in summer cats brought in all kinds of ground-nesting or low-nesting birds. One cat in particular frequently brought in three or four birds a day.

"Careful observers who have watched and protected birds for many years have had the best opportunities for observing the destructiveness of cats. The editor of *Bird-Lore* published the statement from a correspondent that in one summer a neighbor's cat killed all the warblers on the place but one, eighteen in all, also two wrens, two woodpeckers and several other birds which were not identified. Mrs. Oscar Oldburg of Chicago gives a partial list of birds killed by cats on her place, with dates. It contains fourteen individuals of six species and two nests full of eggs. She says also that many juncos are destroyed yearly.

Correspondents report Many Birds Killed.—"The number of birds killed by cats cannot be approximated except by those who have paid particular attention to this subject. Among my correspondents are many such. Rev. Manley B. Townsend of Nashua, N. H., says that vagrant cats are common, and that nearly every day in the nesting season he has found birds killed and torn by cats. He has seen many fledglings in the possession of cats, and many reports of birds destroyed have come to him. Mr. Charles Crawford Gorst of Boston says that a friend told him that his cat had 14 birds laid out for its young one morning before breakfast. Mr. Samuel Hoar of Concord has known a cat to

kill ten birds in a day. Mr. H. Linwood White of Maynard tells me that a cat owned by one of his neighbors recently brought in six adult birds to her young in a day. Mr. Walter P. Henderson of Dover has seen a cat with three different birds in two hours. Mr. J. M. Van Huyck of Lee has seen cats hunting in the meadows for ground birds, getting both old and young, and striking down swallows as they flew over the grass. Mr. A. K. Learned of Gardner has known a cat to kill nine tree swallows in one day. Mr. E. Colfax Johnson of Shutesbury says it is a common sight to see a cat eating a bird. Mr. D. T. Cowing of Russell asserts that his cat lived ten years and killed 170 birds of which he knew and believes that more were killed. Mr. Edward T. Hartman, secretary of the Massachusetts Civil Service League, says that where he lives he commonly sees cats hunting birds, and that he has known them to catch a great many. Mr. Frank E. Watson has no doubt that he has taken 100 birds away from his cat. Mr. George H. Hastings of Fitchburg had a cat that killed at least one bird a day in summer, and was known to kill 31 in one season. Mrs. Charles L. Goldthwait of Peabody called the attention of the owner of a cat to the fact that it had just killed a goldfinch; the owner said that the cat had killed several birds daily, and that it could not be prevented. Mr. A. M. Otterson of Hall, N. Y., has known a cat to kill 13 birds in a day, and to strike down swallows in flight. Mr. George G. Phillips, a member of the Bird Commission of Rhode Island, writes from Greene, R. I., that it is the commenest of sights to see cats hunting birds, and that the young in eight different nests about his house were destroyed by neighbors' cats last summer.

Number of Birds Killed per Day, Week, Month, and Year.— "Numerous correspondents have known individual cats to kill from two to eight birds in a day, but the average is much smaller than this. Two hundred and twenty-six correspondents report the maximum number of birds they have known to be killed by one cat in a day, and the day's work for these 226 cats is 624 birds, or 2.7 birds per cat per day. Only 33 of my correspondents have kept any record of the number of birds killed by a cat in a week, but these 33 cats killed 239 birds in a week, or 7.9 birds per cat. Only 15 have kept any record of the number of birds killed in a month, and these 15 cats have killed 307 birds, or 20.4 birds per cat per month.

Number of Birds Killed in Various States.—"My published statement, estimating the number of birds killed each year by the farm cats of Massachusetts alone, was given on the basis of ten birds per cat per year, and two cats per farm. On this basis the farm cats of Massachusetts would kill about 700,000 birds each year. Through a typographical error, which was corrected in a later edition, the estimate allowed but one cat to a farm, but two was the figure used in the calculation, and our recent canvass seems to show that the farms average almost three cats each. The estimate has been deemed excessive by some, but has been regarded generally as conservative. Dr. George W. Field, chairman of the Massachusetts Commission of Fisheries and Game, estimates that there is at least one stray cat to every 100 acres in the State, and that each kills on the average at least one bird every ten days, through the season making the annual destruction of birds by stray cats in the State approximate 2,000,000. Dr. A. K. Fisher, in charge of Economic Investigations of the Biological Survey, estimates that the cats of New York State destroy 3,500,000 birds annually. Mr. Albert H. Pratt calculates that the farm cats of Illinois kill 2,508,530 birds yearly. Various estimates have been made concerning the number of birds killed annually by cats in New England. They vary from 500,000 to 5,000,000. Considering the above figures my own seem fairly conservative.

Extermination of Island Birds by Cats.—"Space will not allow many details of the cats' destructiveness to birds on islands, but there is room for the sequel to the story told by Mr. G. K. Noble in the *Warbler*, of September 1, 1913. He asserted that on the south end of Muskeget Island a great Massachusetts colony of sea birds protected by the town of Nantucket, the breeding gulls and terns, had been nearly extirpated by cats. Mr. Howard H. Cleaves wrote me in 1914 that the warden in charge said that if the cats continued to increase they would exterminate the entire colony of some 45,000 birds within five years. All over that part of the island the cats mostly inhabited could be seen the uneaten bodies of terns killed on their nests, their heads torn off, and the wings and feathers of those that had been eaten. The mangled bodies of newly hatched young, as well as larger young, were found scattered about profusely. There are no trees on the island, therefore hawks and owls do not nest there, and do not remain there during the nesting season of the birds. There are no

predatory mammals except the cat, and the indigenous short-eared owl was exterminated years ago. Therefore the cat is practically the only enemy with which the gulls and terns have to contend. Mr. Arthur Brigham of Boston wrote me in 1914 that the cats had greatly depleted the number of the birds, and an agent of the Nantucket Society for the Prevention of Cruelty to Animals reported the same year that in a brief search he found fully a thousand nest sites with the remains of parent birds, egg shells, and young scattered about them. Whether the cats increased or not we do not know, but during the summer of 1914 it was easy to gather a bushel of wings of the dead birds. The warden killed three cats n 1913, and may have destroyed a few in 1914, but Deputy Fish and Game Commissioner William Day went to the island in the winter, and, with a good dog, found and shot seven cats, one of them a female heavy with young; another cat was found dead. Mr. Day believes he has killed every cat there, and the dog could find no more. This shows clearly how terribly destructive a few stray cats can be among breeding birds, and how they kill, not merely to eat, but for the love of killing. Since the above was written Mr. W. L. McAtee of the Biological Survey has informed me that more cats have been let loose on the island by fishermen, and that the number of birds was much reduced by them in 1915.

Confining or Tethering the Cat.—"A cat may be tethered to an overhead wire in pleasant weather by means of a line and a snap lock. This gives outdoor conditions, allows the cat to exercise by moving back and forth, and probably will prevent it from catching birds, except possibly such young as may flutter in its way. There should be a stop near each end of the wire so that cat cannot climb or become entangled. Both these expedients are feasible, and many cats now are kept through the summer in confinement, or on a leash in fine weather.

Keeping the Cat Indoors at Night.—"Most important of all, the cat should be kept in the house or some building, cage, or pen at night. Cats which hunt outdoors at night contract colds and diseases, and destroy more birds and game and fewer house rats and mice than at any other time. About 90 per cent of the cats are allowed to roam at night. The mother bird is slain on her nest by the unseen marauder or the young are taken when they first begin to stir at early dawn.

Belling the Cat.—"The experiment of putting a collar and bell on a cat to prevent it from catching birds has been recommended by many people who have never tried it and by some few who have, but the most common experience seems to be that a cat which is skillful enough to creep upon a bird, is expert enough to keep the bell from ringing until the fina' spring. Belled cats catch birds, rats and mice and all forms of wild life; although the bell may save a few birds in some cases, it never saves helpless young. Mr. Neil Morrow Ladd of Greenwich, Conn., records the fact that a sleek, fat Angora cat, although burdened with six bells, brought in during one nesting season 32 birds and in the next 28, none of which it ate."

News and Notes

Distribution of Leaves in Sassafras

The following note is made on the basis of examination of ten sassafras trees and 102 seedlings near Pittsburgh, Pa., and eight trees near St. Louis, Mo. But three kinds of leaves were met with three-lobed, two-lobed and single-lobed, but it may be inferred that the same laws will govern the distribution of the four-five- and six-lobed forms described by Berry some years ago in the *Botanical Gazette*.

The single-lobed leaves are in great preponderance, constituting two-thirds of the foliage in Pittsburgh specimens, while near St. Louis, three trees were observed in which other than single-lobed leaves were wanting. In these an extensive self-pruning had taken place. The terminal leaves of young branches are single-lobed, although there may be an occasional two-lobed leaf. Tops of trees are usually composed almost entirely of single-lobed leaves.

The dissected forms of leaves appear to be most plentifully developed under the influence of shade. In such cases they were most thickly distributed at the middle of the tree (as has been noted for three-lobed leaves in the Britton and Brown Flora); on young twigs whose terminal leaves were dissected, and toward the bottom on older twigs. There was a tendency for more three-lobed and less one-lobed leaves to be found on smaller twigs growing near the trunk, but occasionally on larger twigs, or smaller boughs growing among the larger boughs.

No transitional forms between the three-lobed and two-lobed leaves were noted on the same tree. The latter apparently increases in number as the three-lobed forms decrease, and are associated mostly with the single-lobed leaves, being about equally distributed between the younger and older twigs. They are rarely found at the top of the tree. Evidence that the available amount of light may play some part in the distribution of leaves is found in the fact that the great majority of observed seedlings growing in the shade develop the three-lobed terminal leaves, and a large proportion of the remainder one-lobed or two-lobed leaves in combination. Contrast is offered by a statement made in a standard American textbook of botany—"In Sassafras, almost any leaf may be entire or variously lobed, apparently without relation to transpiration, nutrition, etc."

Bearing in mind the foregoing statement, an attempt was made to ascertain experimentally the relation of amount of light as to kind of leaves developed. This year's twigs bearing only one-lobed forms were tied back into shaded positions. Of ten such cases, three twigs produced isolated, three-lobed leaves. In another lot of the younger twigs bearing only one-lobed forms, the leaves were stripped from the twigs, and these too tied back in the shade. Only one twig of this lot responded, producing two two-lobed and one three-lobed leaf. A consistent explanation of this fragmentary evidence would be that the formative elements for three-lobed leaves in the twigs are stimulated to produce those forms. A more positive point brought out is the lack of proliferating power in the trees under the condition of the experiments—when compared with other forms possessing divided leaves as the mulberry—the majority of mutilated twigs at this season, early August, not renewing their leaves. The writer is indebted for use of material to Mrs. W. G. Gibson of Avalon, Pa., and Prof. W. J. Stevens, Field School, St. Louis, Mo.

N. M. Grier,
Central High School,
St. Louis, Mo.

The Cottonwood

G. H. Bretnall

Many are the beauties we pass by unconcerned! Many are the things that slip our vision, which, if seen, would make life more interesting for us! We are likely to confine our observations of trees to a few kinds which have been brought to our attention by persons or books. We see only what the poet has seen or the writer has described, and give no thought to those which, if understood and studied, would add special charm to our natural world.

One of the most interesting trees on the American continent is the cottonwood although it is generally despised in regions where other trees grow abundantly. We are accustomed to think of it as a noisy, rustling tree and very untidy because of the showers of "cotton" it sheds when it is setting free its seeds; and since its wood is soft and weak, it does not appeal to us from the economic side; but there is another side to its story. Its distinction does not lie in being one of the many beautiful giants of the forests that spread over the rich valleys and humid plains, but lies in the fact that it goes off alone and that it is a pioneer tree which carries the forest out on the plain, the sand heap, the dump pile and turns barren wastes into places of loveliness. A tree that will grow and flourish under these hard conditions is perhaps, the tree that adds most to the happiness of man.

The cottonwood is the dominant and often the only tree growing on the sand bars and mud of river flats. It has the power of sending out roots along its stem when that is covered; thus when the spring freshets pile new layers of sand and mud around its base, it is not killed because its bark does not rot and because it sends out new roots and keeps on growing even though it is almost buried. This resistibility is seen in a finer way in the dunes along a sandy shore of lake or sea. The sand blows in from the beach and covers the young cottonwoods which have started to grow in the moist soil near the shore. As the dunes rise about them, the plucky saplings seem to rise with the sand, although this may pile up sixty or a hundred feet in height. If the cottonwood can keep its head six inches above the sand it will keep on growing, and in the end, become a tree. A few other trees can endure this sand covering, but none so successfully as the cottonwood.

The Cottonwood is dominant on the sand bars and mud of river flats

The cottonwood has other qualities which enable it to hold its own under adverse conditions: Its leaf has a petiole that is not flattened parallel with the blade as in other leaves; but has its flat surface at right angles to the plane surface of the leaf, as in other poplars. This permits the leaf to wave from side to side with the lightest breeze and thus it does not get the full force of the direct rays of the sun, a great advantage in desert regions. The leaf is also quite thick and has a waxy layer on its surface, which enables it to retain its moisture, another valuable asset for life in an arid country. After the cottonwood has established itself and has kept the sand from drifting beyond it, and after it has made a shade and kept the ground moist, other trees come in and a varied forest becomes established. Not only on sand is the cottonwood able to grow but it also flourishes in the rotting rock of the dump piles from quarries, the only tree that can establish itself in such a forbidding location.

To find true appreciation of the cottonwood, we should ask the farmer on the arid western plains what he thinks of this tree; he would probably tell you that he would go miles just to see one. Because of its protected leaves, its deep growing roots and its general hardness, it grows fairly well in regions too dry for other trees to grow at all. If the first settlers of the western plains had planted the cottonwood along the borders of their fields to break the force of the dry, hot winds, not so many of them would have lost all their possessions and have gone back East, discouraged.

To learn to regard the cottonwood justly, one needs to journey to the Pacific coast and back; for it is the one tree that follows you all the way. When all other trees fail because of hard conditions, the cottonwood lifts its head bravely, making a point in the landscape on which theeye lovingly lingers.

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A. J. GROUT, Ph.D., Author and Publisher

NEW DORP, Richmond Bor., N. Y. City

A Norway Spruce
Photo by Cyrus Crosby

Topics for December Nature-Study

ANNA BOTSFORD COMSTOCK

In the minds of most, fortunate children, December is chiefly interesting because one of its days is Christmas; and since Nature Study should always be the child's companion study, we naturally select those topics as far as practicable that have to do with this interesting season. It is well for the child to understand that Christmas is a festive occasion only for human beings, because of the great gift to us of the One whose first Commandment was that we love one another. For the animals, the birds, the insects, the trees and plants, Christmas is merely the beginning of winter, a harsh and inclement season, which they by one device or another have been able to meet successfully.

SECOND GRADE

How the Birds Spend the Christmas Holidays.—This should be a lesson on the food of birds since this element is a determining factor in the birds' chosen place for spending the winter. This

study may well begin with the pigeon. *Use obs. 1, p. 47 to stimulate the pupils to notice the appearance of the pigeon. For further lessons use obs. 3, 4, 5, 6. Obs. 2 and 11 suggest the points on which this Christmas study should hinge, for the pupils may thus understand that because we feed the pigeons and give them comfortable houses in which to live, they do not need to go south in winter. The mourning dove which is wild cousin of the pigeon is obliged to go south to find food and is only a summer resident of the northern states. Obs. 7, 8, 9, 10, p. 48 suggest topics for stories which further illustrate the habits of pigeons.

After the study of pigeons, give the story of the winter migration of robins and bluebirds. They spend their Christmas in our Southern States which border on the Gulf of Mexico, and wonderful to relate, their chief food consists of the berries of holly and mistletoe, although of course they find other wild berries as well. If only holly and mistletoe grew in the North in great quantities, probably our robins and bluebirds would be able to live with us during the winter months. The point to impress upon the children's minds is the necessity for the birds to go where they can find food.

The animals and insects in their Christmas quarters.—In taking up this topic we should select animals with contrasting habits like the sheep, the squirrel, and the woodchuck. The sheep we protect in barns, and feed with hay and grain. The squirrel stores part of its food, and comes out on sunny days of winter and hunts for seeds and other food. See p. 235–236. But the woodchuck eats prodigiously during the late summer and fall and retires to its burrow and goes to sleep for the entire winter. See bottom of p. 229. The toad spends the winter as does the woodchuck, in a burrow deep in the ground, and sleeps unconscious of the cold. The mourning-cloak butterfly finds a cozy nook under the bark of some tree, protected from the storm, and it too sleeps as long as the cold lasts. The Cecropia moth in its pupa stage sleeps in its cradle cocoon under the twig of some tree. Read:—Mother Nature's Children by Gould—Chap. XXIII, XXIV, XXVI, XXXI.

The trees and plants at Christmas.—Trees and plants also have their ways of spending the winter when cold weather makes it impossible for them to do anything but sleep. A tree, bare of its

*References to Handbook of Nature-Study.

leaves in the school yard, should be sketched from the window if possible, at least it should be studied. The leaves are gone but each tiny twig bears buds that contain new leaves tucked safely away, awaiting the spring. In the fall the tree goes to sleep and does not awaken until the warm weather of March and April sets the sap surging up its trunk and out through its branches to bring the message to the little leaves, that they shall unfold and grow. As far as they may be adapted to the use of Second Grade, use outline on obs. 1, p. 733 for calling attention to the appearance of the tree when it is asleep.

Each plant of the field and garden has its own way of passing the winter. If it is a perennial like the violets and goldenrod, or a biennial like the beet or the cabbage, it simply goes to sleep in the fall and awakens the next spring. But if it is an annual like the poppies, it dies in the fall, and its seeds scattered far and near by the wind, sink cozily into the earth, and remain there asleep until the warm spring sunshine tells them it is time to sprout and grow.

THIRD GRADE

The Hemlock.—This was formerly the tree most commonly used for the Christmas tree in the northeastern United States. When it is young it is a graceful pyramid and very well fitted for Christmas decorations. If possible some observations should be made out of doors on this interesting tree. If this is not possible, a study of the Norway Spruce, as suggested in the Fourth Grade, may be used. Obs. 1, p. 802 gives an outline for the first out of doors lesson. Obs. 2 and 3, 4, 5 outline school-room lessons. Obs. 6 and 7 should form a basis for a story to be told to the pupils. See bottom p. 801.

Friend Downy.—Since it should be part of our Christmas celebration to set a table for our bird guests, among which will surely appear the downy woodpecker, this bird belongs to the holiday season. Use obs. 1, p. 71 for an outline for observing the downy as it comes to take the suet. Obs. 2 and 3 suggest subject matter for a story. See bottom p. 70. Obs. 4 and 6, p. 72 give the material for the next out of doors lesson. Obs. 7–9 give topics for a story.

Friend Downy's Foot

The Donkey.—This little animal, so useful the world over, especially belongs to the Christmas tide, since only by its help were Joseph and Mary able to take the Christ Child to Egypt.

If possible, observations should be made on the appearance of the donkey as compared to that of the horse. It is to be hoped that some child, connected with the school, has a pet donkey that can be inspected occasionally, otherwise this lesson would be pointless. The donkey can best be studied by comparing it with the horse. Use obs. 2, 3, 4, and 5, p. 292, a few at a time, and change to suit the pupils of the Second Grade in order that they may notice in detail the appearance of a horse. Use the same outlines in calling attention to the appearance of the donkey. The donkey differs from the horse in the following particulars: Its legs are shorter in comparison with its body; its head is wider; its neck shorter; and its ears larger. The hoof is longer and narrower and more upright. Since the hoof is thicker and therefore tougher it is much better fitted for mountain climbing than is the hoof of a horse. Its tail is a tassel and its mane shorter, its coat more shaggy than those of the horse. It is much stronger than a horse in comparison with its size, and can thrive on one-quarter of the food necessary to sustain a horse. Instead of whinnying like a horse, the donkey brays. For defence against enemies, it can kick and bite. Patience is the chief characteristic of this interesting little beast.

The Shadow-stick.—In December the sun reaches its farthest point in the South of the entire year. To call attention to this, use the shadow sticks, obs. 13, p. 914.

Sunrise and Sunset.—The time of sunrise and sunset should be noted at least once a week during December.

The Cranberry.—This berry not only adds beauty to the Christmas table but it adds to the deliciousness of the repast, and it is very worth studying before it is made into jelly. Each pupil should have a cranberry for this lesson. Its shape and color should be noted. It should then be cut crosswise. How many cells are there in the cranberry? How many seeds in each cell? Describe the seeds. Do they fill the cells? Why are the cells so large? Drop a whole cranberry in a glass of water. Does it float? These cells are water-tight compartments to keep the cranberry afloat. The cranberry grows naturally in bogs and marshes where there are likely to be floods in the fall. If when the

berries are ripe and fall they should sink to the bottom, they would stand small chance of finding opportunity to grow; but they float about on the flooded lands, and when the floods disappear, they may be left in favorable positions for germinating.

Raisins.—The relation of raisins to grapes is not obvious to the child. The wrinkled raisin with its contents of crystallized sugar does not suggest a plump, juicy grape. Yet, if the raisin is studied with relation to its stem, the likeness will be very evident. A Malaga grape should be taken as a type of raisin grape. Note that it has a thin skin which does not slip off the pulp; the pulp is very solid and contains four seeds in its center; these are bell-shaped with the small ends nearest the stem. Compare these seeds with the raisin seeds. Correlated with this study should be reading lessons on the raisin industry of California where tons of grapes are spread on trays in the vineyards to dry in the hot sun. Malaga also is a famous country for producing raisins and a geography reading lesson on southern Spain will add much to the interest of this lesson.

FOURTH GRADE

The Norway Spruce.—This tree in its young stages is a popular Christmas tree in Europe. In fact it is grown as a Christmas tree and at present there are plantations of it in this country for the same cheerful purpose. It is one of our most common and ornamental trees and will repay the effort of making its acquaintance. Lessons on it should extend over several days, the teacher asking for a few observations upon it at a time. Obs. 1, 2, 3, 4, 5, p. 798 are each long enough for a single lesson. In connection with this study should be read stories of Norway and the Alps to give the pupils a background of the native haunts of this tree. If possible the Norway Spruce should be compared with the native spruces. It would be well to compare the Norway Spruce with the hemlock as suggested for the Third Grade.

Winter Study of Birds' Nests.—This should not be merely a study of structure and material. It should lead to an interest in the birds that made the nest and inspire the pupils to become acquainted with them and their ways. Collections of nests, gathered in winter, make an interesting addition to the schoolroom. Each nest when brought in should be labeled as follows: where found; if in a tree, what kind and how high from the

ground; what bird built it. The latter may be guess work; if so, it should be followed by a question mark. Afterward, each nest may be made the topic of a lesson following the outline given in obs. 1–8, p. 147.

The Fox.—Of all the wild animals which have survived the enmity of man, the fox is among the cleverest, and is in many ways the most interesting. He is a near cousin of the dog and has many of the habits which the wild ancestors of the dogs must have had. If the school is in a rural district many items of interest may be added by the pupils as to the habits of the fox, and consultations with old fox-hunters will afford much interesting material for the lesson. However, to make the lesson as vivid and real as possible I would suggest the reading by the pupils of the following stories: *Red Fox* by C. G. D. Roberts, which is one of the best animal stories in print. The Springfield Fox in *Wild Animals I have Known* by Thompson-Seton is very interesting, but rather harrowing. *Silver Fox* by the same author is a fascinating story. Burroughs gives an interesting account of the fox in his *Squirrels and Other Fur-bearers.*

After reading one or all of the above stories, the questions in LXII, p. 259 may be asked. Obs. 4 and 6 suggest topics for stories or themes.

The Turkey.—This truly American bird which Benjamin Franklin wished the United States to adopt as its symbol instead of the eagle, has its place on the Christmas table, and therefore it is well for us to know more about it than merely how it tastes. For this study a live bird is quite desirable, or access to a flock of turkeys is still more so. If this is not possible, I still believe the lesson is worth while even though gathered from books. Almost all of the bird books give an account of the turkey. A very excellent account of it is given in *Birds that Hunt and are Hunted* by Neltje Blanchan. Much of what is known of this bird is summarized on p. 143–5 of the *Handbook of Nature-Study.* The poultry books will give a description of domesticated varieties. After the pupils have become conversant with the habits of the turkey, it may be made the subject of an essay. The wild turkey and its habits is one topic; the varieties of the domesticated turkey and how to care for them is another very practical topic.

Our domesticated turkey has a most interesting history: It was a native of Mexico and was partially domesticated by the

ancient Aztecs; when the Spaniards conquered Mexico they were much impressed by this magnificent bird and introduced it into Spain. From Spain it gradually spread along the shores of the Mediterranean Sea, and in the course of a century or two reached Turkey. Here, the English found the bird and introduced it into England, giving it the name of the country in which they found it. From England it was introduced into the American colonies, and thus found its way back to its original home. The wild turkey, common in our southern states, is a different species and has never been domesticated.

English Walnuts and Pecans.—These are obviously Christmas topics. The way to study these nuts is to compare each with the hickory nut: compare the shells of the two outside and inside, and the way they fall apart; compare the kernels in shape and size; note the sprout, the point of germination. The pecans flourish in the Gulf States and accounts of them may be found in the tree books. The English walnut is grown in southern California. The study of these nuts should be correlated with geography.

Sirius.—On Christmas Eve, a little after seven o'clock, we too, have a wonderful star in the East to remind us of one that led the Shepherds of old. It rises, a great, white, blazing star, after Orion is high in the eastern sky, and a line drawn through the belt of Orion and extended to the horizon, will pass directly through this star. Sirius is the most brilliant of all stars in our sky. It is the great dog star, and it shines with changing colors sometimes blue, sometimes rosy or white. Of course, Sirius like all the true stars, is a great blazing sun and has a diameter fourteen times as great as that of our own sun. The ray of light which meets our eyes from this star started eight and one-half years ago. Sirius is the most celebrated star in literature. All the ancient people knew it, the Egyptians worshipped it, Homer sang of it. It is mentioned in the Bible and it has been an object for poets to write about through all the ages. For a study of the dog-stars, use lesson p, 899. For supplementary reading, Chap. XIV in *The Friendly Stars* by Martin.

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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Editorial

Notice of the Annual Meeting and Election of Officers

The American Nature-Study Society will hold its annual meeting in New York, December 27th. The meetings will be held at Columbia University, inquire at Earl Hall for place of meeting. Hotel headquarters will be Astor Hotel.

The following officers are to be elected; for these offices the nominations are as follows:

For President—L. H. Bailey.

Vice-Presidents—M. A. Bigelow, New York; B. M. Davis, Ohio; E. R. Downing, Illinois; C. F. Hodge, Oregon; C. B. McCready, Canada; A. L. Mathews, Utah; Alice J. Patterson, Illinois.
(*Five are to be elected.*)

Directors—Anna B. Comstock, New York; John A. Dearness, Canada; W. A. Slingerland, New York; L. H. De Wolfe, Nova Scotia; J. B. Needham, New York.

(*Five to be elected.*)

Subscribers to the NATURE-STUDY REVIEW are members of the American Society and may send votes, if they are not to be at the New York meeting, to the Secretary-Editor, to reach him by the 24th of December.

Program of the Annual Meeting of the American Nature-Study Society

MORNING SESSION AT 10:30

A Survey of Normal School Instruction in Nature-Study and Science, Elliot R. Downing
President's Address—The Great Lover ..... L. H. Bailey
Nature-Study Propaganda ..... Miss L. Connelly, Newark, N. J.
Some Advice from a Parent .....
Secretary's report and election of officers.

AFTERNOON SESSION, 2:00 P. M.

A Symposium on Testing Methods and Results in Nature-Study,
Some Recent Tests Tried at Gary, Indiana,
Otis W. Caldwell, Univ. of Chicago, School of Education.
Standardizing Nature-Study { F. H. Holtz, Brooklyn Training School for Teachers. / S. C. Schmucker, Westchester Normal School
Methods of Procedure { Miss Anna B. Comstock, Cornell Univ. / Miss Anna M. Clark, New York Training School for Teachers.
What May We Hope to Accomplish by Nature Tests in the Grades?
J. A. Drushel, Harris Teachers College, St. Louis, Mo.
C. H. Robinson, Mt. Clair State Normal School, New Jersey

Saffron—in History

One of the plants mentioned by Shakespeare is saffron, a plant of great importance in the past and almost forgotten now. The drug known as saffron consists of the dried stigmas of a beautiful pale purple, exceedingly fragrant crocus (*Crocus sativus*). It was cultivated so early that its original home is not known. It is now grown in Spain, southern France, on the south slopes of the Apennines and in Persia and Kashmir. It was used in ancient times as a drug, a perfume and a dye. It is mentioned in the Bible and Homer refers to it. Because of its fragrance, it was strewn in Greek halls, courts and theaters and the Romans used it in their baths. In ancient Ireland the king's mantle was dyed saffron; it was used in illustrating medieval manuscripts; and the sacred spot on the forehead of a Hindu Pundit was marked partially with this dye.

It requires 4,320 flowers to produce enough stigmas, when dried, to make one ounce of the drug. Naturally this makes it very expensive and in former times stringent laws were made against its adulteration. In Germany in 1444 A.D. a man was burned, together with the saffron he had adulterated; and twelve years later a man and woman were buried alive for the same offense. Saffron is deep orange red in color and one grain of it will make yellow ten gallons of water.

Book Reviews

The Principles of Plant Culture. By E. S. Goff. Revised by J. G. Moore and L. R. Jones.

This is the eighth edition of the Principles of Plant Culture. The first edition came out in 1897. The book is well named, for the author and revisers have succeeded in giving to the practical phases of plant culture a true scientific background. Young people who use the book will find not only clear, definite directions for the proper care of plants but at the same time the underlying principles of plant life that give a scientific basis for the treatment suggested.

The first chapter is an introduction to some of the more general terms and principles of biology. The next five chapters treat of "The round of plant life from the first swelling of the planted seed, through the development of the embryo into the plantlet." This includes a study of the various plant organs, their function, relation to the external world, and the conditions necessary for them to do their work.

Chapters 8 to 13 inclusive deal with the difficulties that plants meet: The plant as affected by water, by unfavorable temperature; by unfavorable light and wind, unfavorable food supply and plant and animal parasites. The remainder of the book discusses different methods of propagation, transplanting, and plant breeding.

The book has a number of good illustrations. Teachers of elementary agriculture in country schools will find this an excellent book to have in their school libraries. A. J. P.

Bailey. Principles of Fruit Growing. Revised. Published by The Macmillan Company, 66 Fifth Avenue, New York City. Price $1.75.

This is a revision of Dr. Bailey's well known book which was first published in 1897. This is the 20th edition and has been rearranged and largely rewritten.

The general principles of fruit growing are discussed under the following large heads: Location, tillage, enriching, planting, care of plantation, harvesting, and marketing. The book is organized on the basis of the general principles involved in raising fruit, and under each of the above topics the application of each principle to the more common fruits is given.

Among the changes found in this edition in comparison with the previous edition are the following: A more complete treatment of the laying out of the plantation and of the care of the fruit plantation, a special chapter being devoted to accidents and injuries. The chapter on spraying contains a valuable addition in the form of a list of the more common fruit insects, with suggestions on the treatment to be used. These insects are grouped according to the fruits that they most commonly attack. The list of American books on fruit growing has been omitted from this edition.

The book closes with the following sentences:

"The fruit grower should first apprehend the principles and the underlying reasons, and to teach this is the prime purpose of the book, while still everywhere discussing the practice. If the grower knows why, he will teach himself how."

G. H. T.

My Growing Garden. J. H. McFarland, pp. xiii and 216. Price $2.00. Macmillan Company.

The significance of the title is this, that the author has not had made for himself a garden all at once, but it has gradually grown under his care. It is an exceedingly interesting garden, for the author has not only developed a variety of plants in it, but also a happy philosophy. I quote a paragraph from the chapter on Planting of all Sorts. "If there is anything more worth getting wet in than a warm April rain, I do not know about it. It is quite comfortable, thank you, to the normal out door human, and it is seemingly exciting to most plant growth. I have been standing under the big Norway maple at the west end of the formal garden, seeing things happen, and inhaling the intensified sweetness that this sort of shower brings out. The maple blooms overhead literally drip fragrance, and wherever in the borders the dainty arabis is planted, there is a spot of white, faintly odorus. The yellow perennial alyssum is like a spot of sunshine in the rain, while the bells of the convallaria—a name so much easier to say than lily-of-the-valley—have each a crystal hanging from them."

From the quotation above it is evident that the book is more than a bare statement of what to plant and when to plant; it is this and more. The book is abundantly illustrated with color plates as well as half-tones which add much to its fascination.

The Measurement of Intelligence. Louis M. Terman. pp. xix and 362. Houghton Mifflin Co. Price $1.50.

The educator is no longer content with the accomplishment of results, he must know definitely the type of mind with which he is dealing, must know the progress he is making in terms of actual measurement, and he wants to test his final results in ways that lend themselves to expression with mathematical exactness. In nature-study little progress has yet been made in any one of these three lines. We have little knowledge of what information or mental equipment the average child may be expected to have on entrance to school. Few tests have been put in preparation for determining the relative value of various methods of instruction, and still less apprises of the results that are accomplished. This book makes no immediate contribution to the testing of nature-study work, but it does help lay the foundation for all such measurements. The first part of the book deals with the general use of intelligence tests, particularly the Binet-Simon tests. Part two takes up the detailed instruction for conducting this test as modified by the Stanford Revision and these instructions are given for each year. Some of the special titles in the chapters are material suggestive to the nature teacher, such as finding out what the child knows of the names of the parts of its body, of familiar objects, of colors, and ability to interpret pictures. Anyone who is going to undertake the testing of children in nature work should at least be familiar with such a book as this.

WANTED

The following back numbers of The Nature-Study Review: 1 copy May, 1915 issue, 20c.; 15 copies Sept., 1916 issue, 10c.

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The New Bird Laws

All lovers of wild life are to be congratulated over the fact that the new Federal Migratory Bird Law has been construed by the regulations which were adopted and issued August 21, 1916, in such a way as will prevent all Spring shooting of water fowl. Also to protect Band-tailed Pigeons, Cranes, Wood ducks, Swan, Curlew, Willet, Upland Plover and the smaller shore birds until September 1, 1918, at which time it is to be hoped that those having charge of these matters will have sense enough to extend the closed season for Cranes, Wood ducks, Swan, Upland Plover, Woodcock and similar birds indefinitely.

Likewise bird lovers are to be congratulated over the fact of the ratification of the United States—Canadian bird treaty which protects 1022 species of migratory birds for all time. This is as it should be a move in the right direction, and will result in an estimable benefit to the agriculturists in both Canada and the United States, if it is enforced without fear or favor as it should be.

Both the new Federal Migratory Bird Law and the United States-Canadian Bird Treaty referred to, make proper provisions for reasonable scientific collecting.—R. M. BARNES, from *The Oologist.*

Observations on the Polyphemus Larva

A fine spec men of the polyphemus larva was placed in our insect cage. It began spinning in an upper corner, but fell after putting quite a heavy coating of silk on the top and the sides. The next morning it had spun considerable of a new cocoon in a lower corner, the silk being fastened to the cage and a glass that held leaves. This glass being taken up, the web was broken, which caused the larva to abandon that place. The following morning, the larva had begun a new cocoon, this time by the side of a cup fastening the web to the side of the cage and the cup letting it rest on the bottom of the cage.

Having lost much silk in its previous efforts, the larva was able only to make a bed, quite a capacious one though. It was lying in this on its back the next, or fourth morning, with the cast skin by its side. It looked just as before, except a slight tinge of pink on the abdominal segments, a very small spot though. This gradually spread during the day, that colored first slowly, getting darker. By evening, the outline of the moth became

visible, its w ngs, antennae, etc., and it had also become a beautiful brown all over. The four follow ng days he was quite an ac ve fellow, every now and then twisting and squirming. At one time he was watched for five minutes, seemingly trying to turn over, but when he was jus about successful, back he would roll. Occasionally he would turn slightly on one side.

Now he is lying quietly on his back, not responding to my touch unless it is too annoying when he wiggles to show his resentment.

The cocoon is two inches in diameter and three fourths of an inch deep. It is really a bed.

MARY B. BISKICHT,
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